DEVELOPMENT OF A MODIFIED AIDS TO NAVIGATION MANAGEMENT INFORMATION SYSTEM FOR THE UNITED STATES COAST GUARD WITH AN ILLUSTRATED APPLICATION THROUGH COST-EFFECTIVENESS AND MALFUNCTION ANALYSES

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THESIS

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by

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March 1975

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Aids to Navigation Management Information
System for the United States Coast Guard
With An Illustrated Application
Through Cost-Effectiveness and Malfunction Analyses

by

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requirements for the degree of

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ABSTRACT

The purpose of this project is to identify, examine, and evaluate certain cost-effectiveness relationships of the Short Range Aids to Navigation (SRAN) Sub-system developed, established, operated, and maintained by the United States Coast Guard. While attempting to achieve this objective, it was determined that a need exists to modify the present Aids to Navigation Management Information System. The Simplified Aids to Navigation Data System (SANDS) is the present information system. The Aids to Navigation Work Report (CG-4429), which is the basic source of raw data, is prepared by Coast Guard units at the scene during the time a navigational aid (navaid) is serviced. In addition to providing information, this report becomes a legal and historical record of the navaid. The present content and format of the work report has remained essentially unchanged since its inception in 1967. Questions have been raised as to whether the content and format of this report should be amended, and if so, how? The Annual Aids to Navigation Assignment List (CG-4500) is the main source of information prepared for operating units engaged in servicing navaids. It is also questioned whether the information contained in this list is responsive to the needs of servicing personnel, and whether potential information available to the Management Information System is being fully developed. A modified Management Information System is presented and its application illustrated through selected cost-effectiveness analyses.

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ACKNOWLEDGEMENT

For most Coastguardsmen engaged in Aids to Navigation operations, there is barely enough time to get the job done to satisfaction, even if time is used wisely. Seldom is there sufficient time left over to pursue, in depth, various areas of interest associated with the work. The opportunity to look intensively at some existing and potential Aids to Navigation problems is thus most challenging and welcome.

Many have contributed a great deal to this phase of the research project. The author would particularly like to extend his appreciation to LCDR Darwyn Buettner CCGD13(oan), LCDR John Overath CCGD9(oan), LCDR Guy Clark (GWAN-1), Mr. Frank Thompson (GEOE-3), LT James Ingham (GLCL), ENS Mark Werneke (GWAN-2) and to the thesis advisors of the Naval Postgraduate School. The author would also like to mention that without the stimulation and guidance of CDR Daniel Mania and LCDR Stanley Powers in the field, and the many hours of data keypunching assistance from his wife Pat, this project would not have been possible.

I. INTRODUCTION - SELECTION OF AREAS OF STUDY

Ever since colonial times, when buoyage of navigable waterways in this country was begun, constantly expanding and more effective marine aids to navigation have played an important role in successful navigation. The United States Coast Guard is the federal agency which "shall develop, establish, maintain, and operate, with due regard to the requirements of national defense, aids to maritime navigation, icebreaking facilities, and rescue facilities for the promotion of safety on, under, and over the high seas and waters subject to the jurisdiction of the United States."[1] Today the Coast Guard maintains over 46,000 aids to navigation in the Aids to Navigation System. Specific statutory authority for Aids to Navigation is contained in 14U.S.C.81:

> "In order to aid navigation and to prevent disasters, collisions, and wrecks of vessels and aircraft, the Coast Guard may establish, maintain and operate:
>
> (1) aids to maritime navigation required to serve the needs of the armed forces or of the commerce of the United States:
>
> (2) aids to air navigation...

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[1]TITLE 14 - Coast Guard, United States Code, Section 2 (14U.S.C.2), U.S. Code Volume Three, January 20, 1971, with SUPPLEMENT III, January 21, 1971, to January 20, 1974, p. 2888. Section 2 defines the Primary Duties of the Coast Guard which have been organized into ten separate missions or functions. Three of the missions, including Aid to Navigation, are described in the above passage.

(3) electronic aids to navigation systems..."[2]

The Commandant, who heads the Coast Guard from Headquarters at Washington, D.C., has been charged with the development, establishment, operation, and maintenance of the Federal Aids to Navigation System by delegation from the Secretary of the Department of Transportation. Under the Commandant's direction these aids to navigation functions, as well as other functions, are carried on by twelve geographically separated district organizations, each under the supervision of a District Commander. A District Commander is assisted by staff, support units, and field units in the operation and maintenance of aid to navigation within his district. In addition to these aids to navigation maintained under the Federal Aids to Navigation System, there are also about 31,000 state and privately maintained aids to navigation in the United States established under the authority of the Coast Guard.

Regulations for the general public, intended to promote safe and economic movement on the waterways and seas, are promulgated by the Commandant in the Code of Federal Regulations. The Aids to Navigation Regulations, which pertain to federal, state, and privately maintained aids to

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[2] U.S. Code, Volume Three, p. 2894.

navigation, are contained in ten parts of Subchapter C of Chapter 1, of TITLE 33 - Navigation and navigable waters, of the Code.[3]

An Aid to Navigation "is any signal device external to a vessel or aircraft specifically intended to assist a navigator to determine his position or safe course, or to warn him of dangers or obstructions to navigation."[4] An aid to navigation system "is a group of reference devices acting together to provide information to assist an operator in directing the motion and defining the position of his craft."[5] A device can be a floating buoy that is moored at the bottom or a structure which is fixed to the bottom. Active signals that may be transmitted to the navigator are visual (light), audio (sound), a radiobeacon pulse, or a LORAN Pulse.

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[3]The Code of Federal Regulations is a codification of general and permanent rules published in the Federal Register by Executive Departments and Federal Agencies. The Code is compiled under 50 broad area titles each of which is divided into chapters, usually concerning a particular agency. Each volume of the Code is revised at least once a year and is kept up-to-date by individual issues of the Federal Register which is published daily. Subpart 1.46 of Title 49-Transportation describes the delegation of authority by the Secretary of Transportation to the Commandant of the Coast Guard. Section 1.01-1 of Title 33 contains the general provisions whereby delegation of authority by the Commandant is vested in the District Commanders.

[4]TITLE 33 - Navigation and Navigable Waters, Code of Federal Regulations, Chapter 1 - Coast Guard, Department of Transportation, Subpart 60.01-5 (33CFR 60.01-5), revised July 1, 1974, p. 234.

[5]Coast Guard Aids to Navigation Manual, Book 1, Administration (CG-222-1), 17 May 1972, amended through Change 3 of 1 August 1974, p. 3-1.

There are four basic Aid to Navigation Sub-systems within the overall Federal Aids to Navigation System. Table I shows a breakdown of the various types of navigational aids (navaids) within each sub-system. Appendix A shows total numbers of various Short Range Navaids.

There are four basic programs within the total Aids to Navigation System, relating directly to the four sub-systems. Each program includes, in addition to its own sub-system of navaids, all ships, boats, personnel, facilities, equipment, and devices that collectively operate and maintain a particular sub-system.[6]

Important to the overall usefulness of the Aids to Navigation System are different forms of related marine information which are prepared and issued by several federal agencies including the Coast Guard. Charts, which are prepared in various scales for navigable bodies of water, contain a wide variety of general information, including information and positions of navaids in the area, enabling a navigator to plot and keep accurate track of his position. Coast Pilots, which is printed in ten volumes, provides detailed information for the navigation of coastal waters to

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[6]This structure is established as part of the Federal Planning-Programming-Budgeting System (PPBS), introduced in the mid 1960's which requires federal agencies to structure their activities into programs devoted to the same end and measure the resources of each program. Where no measure of the amount of output is available, program comparisons may be permitted on a heuristic or intuitive basis. Public Microeconomics, Neil M. Singer; Little, Brown and Company, (Boston), 1972, p. 207.

TABLE I

LIST OF NAVIGATIONAL AIDS WITHIN

EACH AIDS TO NAVIGATION SUBSYSTEM

1. Short Range Aids:

    a. Non-electric audio and visual aids:

        1) Lighted buoys

        2) Unlighted buoys

        3) Light structures (unmanned)

        4) Day beacons (unlighted and unmanned structures)

        5) Sound signals (1 manned station, remainder part of other navaids)

    b. Electronic short range radionavigation aids (radio beacons, 1 manned station, remainder part of other navaids).

    c. Aids with dual non-electric and electronic capabilities:

        1) Lightship stations (manned)

        2) Lighthouses (unmanned or manned) and Light Stations (manned)

        3) Large Navigational Buoys (LNB) (usually unmanned)

        4) Offshore platforms (manned or controlled remotely)

2. LORAN-A: Medium range electronic radionavigational system intended for general use.

3. LORAN-C: Medium range electronic radionavigational system intended for Department of Defense applications.

4. Omega: Long-range, worldwide, radionavigation system.

supplement the limited information given on charts, while The Great Lakes Pilot provides similar information for the Great Lakes. The Coast Guard publishes annually, in five volumes, Light Lists with complete details regarding all aids to navigation it maintains or which are under its authority. The lists include the official name, signal characteristics, location, and a general description for each navaid. The Coast Guard continually updates this information through broadcasts and documents. "Broadcast Notices to Mariners" made from Coast Guard or U.S. Navy radio stations report warnings that contain information of importance to the safety of maritime navigation, such as significant changes or deficiencies of navigational aids or hydrographic information received too late to be published in Local Notices to Mariners. Weekly or more often as needed, Coast Guard District Offices issue "Local Notices to Mariners" containing local waterway information deemed necessary in the interest of public safety.[7] Mariners enhance the effectiveness of these marine information networks by reporting suspected navigational aid deficiencies, errors in charts or light lists, or any potential navigational hazard encountered in transit.

Short range aids, which form the focus of this research, are made up of two separate groups of components: physical support, and signal equipment systems. For a buoy, required

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[7] 33 CFR 72.01

physical support components include the buoy body (floatation source) and chain, shackles, and sinker (moorings) which anchor a buoy in a certain position. A bridle and swivel are used with lighted buoys and a ballast ball is sometimes used with large unlighted buoys. A buoy's position is certain only within limits, as its length of chain is somewhat greater than the depth of water at its charted position to facilitate free floatation. Thus, a buoy will drift within a small circle, following wind and current. Furthermore, buoys may be missing, adrift, or off charted position due to collisions or storms. For a fixed structure the <u>support system</u> is the ground it is built upon (ashore or at a marine site) and the structure itself. The optional signal equipment system for buoys and structures usually contains similar visual equipment but different audio equipment. Components used to transmit an active visual signal are batteries or other power source such as commercial power (used solely by structures), the lamps and a lampchanger, a flasher which turns a lamp on and off in a distinctive pattern called the characteristic, a lantern which refracts and directs light from the lamp and gives it a green, white, or red color, and a daylight control. Active audio signal components for buoys include bells and gongs with clappers and whistles that are activated by buoy movement in the water. Lighted buoys also can transmit electric bell, horn, or whistle sound signals. Sound signals for structures are usually powered electrically or by compressed air and have more distant

range capabilities than buoys. Passive signal features that may be built into a buoy are strongly contrasting colors, retro-reflective materials, numbers or letters, an easily identified shape or profile, or a radar reflector.[8] Radar reflectors are inherent in structures. Other passive features for a structure are displayed on a daymark which is secured to the structure. A daymark is a board that may possess distinctive characteristics of shape, color, and retro-reflective materials, numbers or letters. For a lighted structure a daymark is the daytime aid to navigation: its features must be consistent with the nighttime light color and characteristic.[9]

Selection of Areas of Study: This project will focus in particular on the Lighted Buoy Group of the Short Range Aids to Navigation (SRAN) Sub-System. Lighted buoys were selected as the primary area of study for the following reasons:

1. Their relatively significant number and importance within the overall Aids to Navigation System.

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[8]The lateral system of buoyage used to mark waters of the United States employs a simple arrangement of shapes, numbers, colors, and light characteristics to indicate on which side a buoy or structure should be passed when proceeding in a given direction. Directions vary depending upon the area of the United States being transited. 33 CFR 62.20 and 62.25.

[9]A Buoy Tender Manual, Aids to Navigation School, U.S. Coast Guard Training Center, Governors Island, N.Y., p. 4, April 1971.

2. Of all short range aids, they include characteristics and features that present the most opportunities for failure. For example, lighted buoys combine standard visual signal components of most light structures with the unfixed position trait of unlighted buoys.

The project was completed in five phases: study selection, data collection, data examination, information system modification, and study completion.

Phase One involved the identification of certain Aids to Navigation (A-to-N) reliability and optimization relationships. The primary area chosen for analysis was the relative importance of various relationships between Aids to Navigation reliability (the probability that an aid functions 24 hours a day) and causes of nonfunctioning. An aid may be nonfunctional due to administrative errors, personnel errors, logistic errors, technological errors, hazards of weather, collision, and vandalism, and manufacturing errors -- failures due to defects in workmanship or premature wearout. Initially batteries alone and subsequently all lighted buoy components were selected in examining the frequencies of various causes for aid malfunctions and determining hazard, failure, or error proneness.

Phase Two of the project involved collection of data pertaining to the selected areas of study. Data were collected from the Thirteenth and Ninth CG Districts, serving the Pacific Coast states of Oregon and Washington and the Great Lakes area respectively. Data from the Thirteenth

District were collected because they often included recorded closed circuit voltage battery readings. This is a voluntary recording procedure in the current SANDS program and although taking such readings is practiced throughout the Coast Guard, the Thirteenth District is unusual in that the readings are recorded. Additional data were collected from Aids to Navigation, Ocean Engineering, Data Systems, and Claims and Litigation Division Branches of CG Headquarters, and from the CG Supply Center in Brooklyn, N.Y. Visits were made to the Aids to Navigation School, Governors Island, N.Y. and Eleventh and Twelfth CG District Aids to Navigation Branch Offices.

Phase Three consisted of examining the data collected to ascertain its suitability for the areas of study. During this phase and after many telephone conversations to the Thirteenth District and Headquarters, it became apparent that a need exists to modify the current Aids to Navigation Management Information System. This contention is supported by the fact that, in a separate effort, an Aids to Navigation Work Report Form with major revisions currently is being tested on an experimental basis in the First CG District.

Substantial evidence that modifications to the Management Information System are desirable has been provided as a result of studies conducted by the management consultant-research firm Booz, Allen Applied Research, Inc. In their systems analysis studies of the servicing and support systems for Coast Guard Short Range Aids to Navigation, Booz, Allen concluded:

"...Additional effort should be applied to make the Simplified Aids to Navigation Data System (SANDS) fully operational..."[10]

"Additional statistical information on outages and servicing frequencies is needed from SANDS to identify ways of increasing efficiency with which aids to navigation are serviced, and also provide data for the design and acquisition of new aid-to-navigation systems and servicing facilities."[11]

"In addition to additional computer facilities and capabilities, deficiencies discovered through experience with the current SANDS Program require a thorough program evaluation and revision to provide the information that is desired by both operational units and administrators..."[12]

It was decided that a separate study into determining feasible modification alternatives to the present Aids to Navigation Management Information System was compatible with the original purpose of this research. This decision led to the search for modification procedures with the following goals:

1. Modification of all phases of the Management Information System in such a manner as to save time where possible for all Aids to Navigation personnel, especially the time of field servicing and reporting units.

2. In view of the major effort already being put into the SANDS Program, further develop potential information available to the Management Information System.

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[10] Evaluation of Plastic versus Steel for Buoy Hulls, Contract Number DOT-CG-90506-A, January 7, 1970, p. 9.

[11] Evaluation of Minor Marine Structures versus Buoys, Contract Number DOT-CG-90506-A, May 15, 1970, p. 9.

[12] Servicing System for Short-Range-Aids to Navigation, Contract Number DOT-CG-90506-A, November 7, 1970, p. 74.

Phase Four involved determination of a model Aids to Navigation Management Information System. To achieve both goals, several Aids to Navigation Work Report content changes were envisioned, leading to recommendations for future modifications of the SANDS reporting form. In order to obtain the second goal, an additional processing method for SANDS data was deemed desirable. A pre-packaged computer program suitable for this purpose was found. Feasible acquisition and installation of the package discussed is particularly timely in that the Coast Guard and other DOT agencies[13] with headquarters in the DOT, Departmental Headquarters Building anticipate consolidation of present data processing facilities in the near future. The procurement cost of the package in question is under $1,000.00.

Phase Five consisted of the completion of the selected areas of study using the package during various stages.

Because of the limitations in the empirical data, capabilities of the author, time, and scope of this project, this research should be regarded as preliminary. It is suggested that a team of personnel possessing expertise in analysis and information systems design complete a thorough evaluation of the issues raised and presented. The author believes that effective implementation of Aids to Navigation Management Information System modification procedures similar to those presented will contribute to the sound policies of standardization, simplification, and cost-effectiveness.

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[13]These include the Federal Highway Administration and the Federal Railway Administration.

II. DEVELOPMENT OF SHORT RANGE AIDS TO NAVIGATION

A. AN HISTORICAL REVIEW

The official beginning for the Aids to Navigation System was the Ninth Act of Congress of August 7, 1789, which provided for the erection and maintenance of lighthouses. Lighthouses built by the colonies were ceded to the Federal Government; and, together with wooden buoys already in use, these lighthouses became the nucleus of the present Aids to Navigation System. By the 1850's buoys built with iron and improved wooden buoys, employing black or red color and numerical significance standards (which eventually became the present lateral marking system) were marking channels. A lighted buoy using Pintsch gas under mantle was introduced in New York Harbor in 1881, but subsequent attempts to electrify buoys in New York Lower Bay through shore cables from 1888 to 1903 proved to be impractical. Meanwhile buoys built with whistles and buoys with mounted bells struck by clappers were successfully used to produce sound signals when a buoy was set in motion by the sea. Further attempts to redesign buoys led to taller can and nun shaped unlighted buoys which were first mentioned at the turn of the century. In 1910, lighted buoys were developed which used acetylene gas compressed inside tanks that were stored within buoy pockets. These buoys were the forerunner of the type of

lighted buoy in general use today.[14] By the early 1920's buoys equipped with gongs and clappers joined whistle and bell buoys in producing sound signals.

On July 1, 1939, the responsibilities for Federal Aids to Navigation which had formerly been carried out by the U.S. Lighthouse Service were permanently transferred to the United States Coast Guard.[15]

B. DESCRIPTION OF A LIGHTED BUOY BY COMPONENT

Development of the Aids to Navigation System into a reliable network promoting safe and economic navigation has required not only technological progress by our society, but also major development, operation, and maintenance efforts by the Coast Guard. Despite these efforts, the Aids to Navigation System is subject to failure in terms of hardware malfunctions, incorrect positioning of aids, and incorrect or incomplete information dissemination. Of all navigational aids, lighted buoys include characteristics and features that present the most opportunities for failure. A discussion of hardware malfunctions and positioning errors, and methods of preventing and correcting them, presupposes some familiarity with the components and operation of a

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[14] Piloting Seamanship and Small Boat Handling, Charles F. Chapman, The Hearst Corporation (New York), 1961, p. 299.

[15] At this time the Coast Guard was serving within the Treasury Department. In 1967 the Coast Guard and all functions, powers and duties relating to the Coast Guard were transferred to the Secretary of Transportation by STATUTE AT LARGE (80STAT 931) which created the Department of Transportation.

lighted buoy. The description of a typical lighted buoy equipped with standard components is presented in Figures 1, 2, and 3 and corresponding Tables II and III. An explanation of each component's function and general terminology are included.

Buoys are classified by their size, type, and equipment composition. For example, an 8 x 26 LBR description would classify the buoy as being eight feet in diameter through the buoy and twenty-six feet long, lighted, having a bell, and having a radar reflector. Unlighted buoys are broken down into six classes of sizes, first class being the largest. A 5NR description would classify the buoy as being fifth class, nun-shaped, and built with a radar reflector. Larger buoys are used in exposed locations since they ride better in rough seas or bar areas, and can support needed heavier chain. The lamp size, flasher type, and length of daylight determine how many ampere hours per day of a battery are consumed. The lamp size, type and height above water, lantern type, atmosphere transmissivity (clear, haze, fog) and height of the user determine how far a light may be seen at night. Only group flashing, red, or green lights indicate lateral significance.

C. HIGHLIGHTS OF MAJOR INNOVATIONS AND DEVELOPMENTS BY THE COAST GUARD

1. Standard Buoys (1940-1962)

In 1940 the decision was made to standardize the more than 400 different variations of buoy types in order

A Typical Lighted Buoy Showing Principal Parts and Appendages
With Non-scale Blowup Drawings of Components

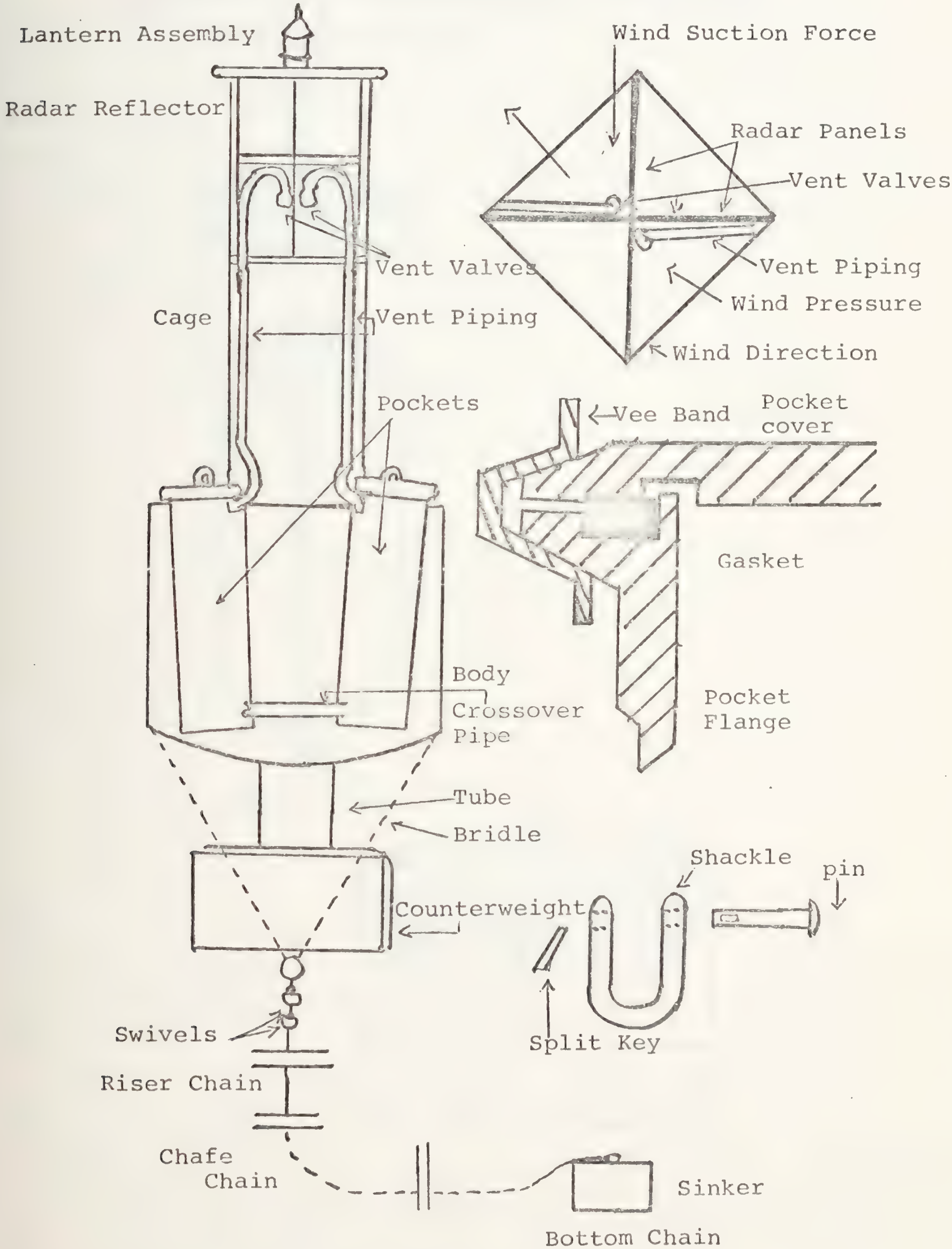

FIGURE 1

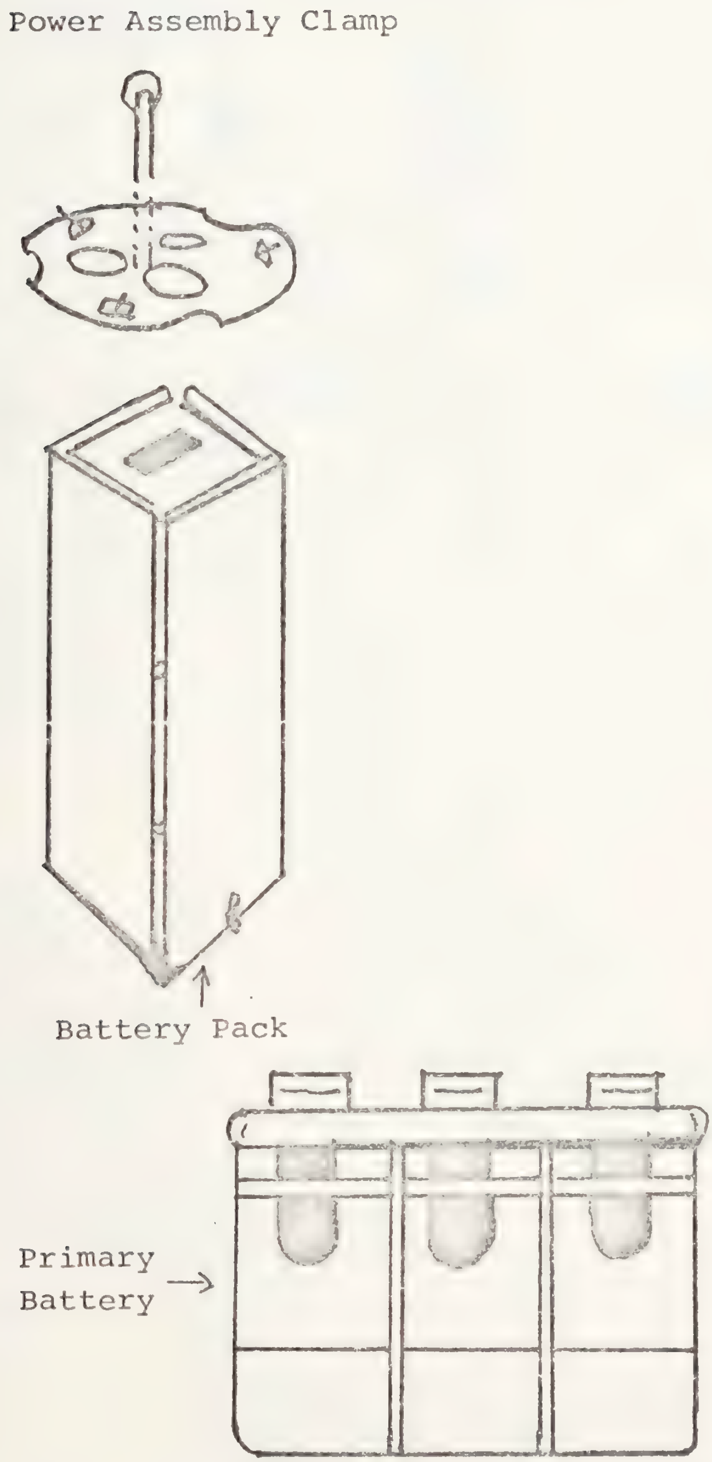

FIGURE 2

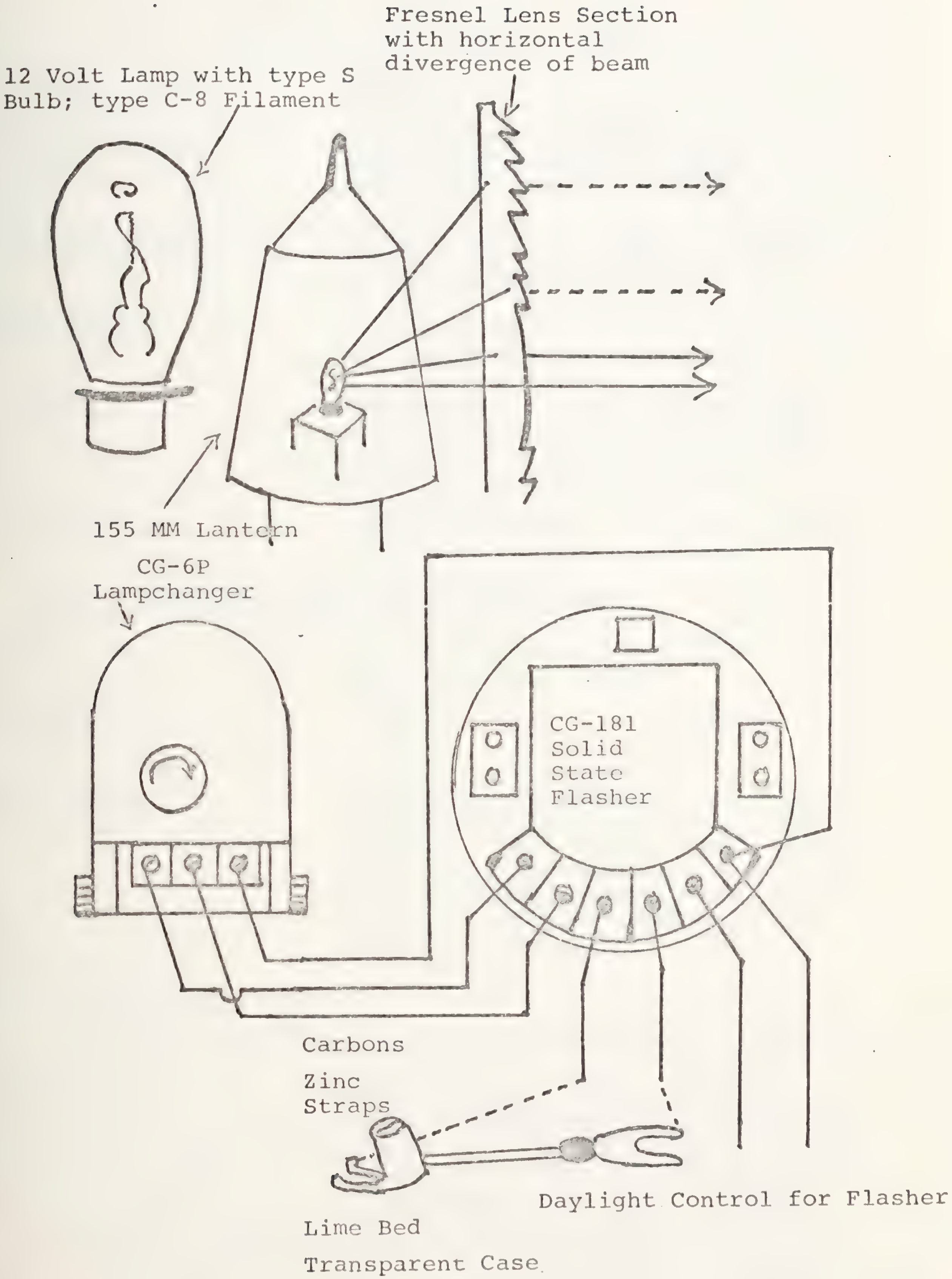
Fresnel Lens Section
with horizontal
divergence of beam
12 Volt Lamp with type S
Bulb; type C-8 Filament
155 MM Lantern
CG-6P
Lampchanger
CG-181
Solid
State
Flasher
Carbons
Zinc
Straps
Daylight Control for Flasher
Lime Bed
Transparent Case

FIGURE 3

TABLE II

LIGHTED BUOY SUPPORT SYSTEM

Part	Purpose
Buoy Body (Hull)	A steel body providing a floatation source and platform to support all other components or parts.
Counterweight Tube	Lowers center of gravity so that the buoy floats in an upright position at its designed waterline.
Cage (Tower)	Structure mounted on top of the body to support the signal system.
Pockets	Two hollow watertight tubes, built symmetrically into the body, which hold power units that provide DC energy to the signal system.
Pocket Closure	Coupling, gasket, and pocket cover to provide watertightness of a pocket.
Air Circulation and Venting Sub-system	
Vent Lines	Piping 3/4" in diameter for air venting of each pocket.
Crossover Pipe	Crossover line between the two pockets to enable circulation of air.
Vent Valve	Gravity-operated device consisting of a valve seat, valve body, and two weights. This device closes to provide watertightness as a buoy heels over and rolls under water, then opens as the buoy approaches or remains in an upright position.
Mooring Sub-system	
Appendage - any component part of the mooring sub-system	
Bridle	Two lengths of chain attached to arms on opposite sides of the buoy and linked together with a large center ring that is tied in with the mooring system. The ring rides just above the bottom of the counterweight tube to prevent entangling. There are wooden fenders attached lengthwise to the tube to prevent wear from rubbing.

TABLE II (continued)

Swivel	Device that permits free twisting of the buoy without causing the chain to kink or twist.
Chain	Welded steel links of up to 1 7/8" in diameter joined in series to connect appendages at the buoy to the sinker at the bottom. The riser section runs from the buoy to the bottom. A chafe section, usually made of heavier chain than other sections because it wears first, lies on or near the bottom and is dragged about depending upon buoy movement. The bottom section near and connected to the sinker is usually mudded or sanded in and undergoes little wear. Normally the total length of chain used to moor a buoy is 1 1/2 to 5 times the depth of the water at its position. The weight of the chain helps to hold a buoy in position but it cannot be so heavy that it causes the buoy to float low in the water. In some areas with very deep water, nylon line has been successfully used as a riser section of the mooring.
Shackle, Pin, and Key	Hardware used to fasten various mooring appendages together and tie moorings into the buoy. Shackles use split key pins or riveted pins. Split keys, used only once, are designed to work similar to conventional cotter keys. Stainless steel split keys are most often used.
Sinker	Concrete or cast iron weight that provides the brute holding strength to moor the buoy to the bottom. Sinker weights vary according to exposure, with heavier sinkers used to moor buoys encountering rough seas or strong currents. Sometimes more than one sinker will be used to moor a buoy. Weights range from 9 tons down to less than 100 lbs.

TABLE II (continued)

Passive Features

Radar Reflector	Device built into the cage that is especially designed to reflect high frequency radio waves transmitted by radar transceivers. This device is also designed to promote a wind suction force for the air circulation and venting sub-system.
Retro-reflective Materials	Material made in panels, numerals, and letters that reflects light from an outside source back along the same path it traveled in reaching the reflective material.

Sources: A Buoy Tender Manual, p. 15-33.
U.S. Coast Guard Ocean Engineering Report No. 38B (CG-250-38B), "Buoy Classification and Description," 9 Sept. 69.

TABLE III

LIGHTED BUOY VISUAL SIGNAL SUB-SYSTEM

Part	Purpose
Battery	Basic non-rechargeable primary cell or group of cells providing DC energy from a self-contained source. A battery contains carbon cathodes that require a dust free surface and air flow, zinc anodes, a caustic potash electrolyte, and breathing apparatus. While outer cases have been made of polyethelene, transparent acrylic plastic cases were recently developed. A battery is activated by the addition of water to each cell.*
Power Unit (rack, pack)	A combination of primary batteries in a disposable container. Batteries are connected in series or parallel to form a 12-volt bank, depending upon ampere-hour capacities desired. If only one power pack is utilized for a buoy, the empty pocket normally contains ballast equivalent in weight to the pack in the other pocket. Batteries come in 1000 and 3000 ampere-hour capacities. By connecting in parallel, 2000 and 6000 ampere-hour capacities can be obtained. Batteries are securely housed inside a wooden rack to make up a unit. 1000 ampere-hour units weigh about 200 pounds; 3000 ampere-hour units weigh about 500 pounds.

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*Primary batteries are not rechargeable and used only once or through multi-seasonal use until battery capacity has been consumed. They have no salvage value and after use are to be disposed of at proper shore facilities. Secondary batteries are similar to the conventional automobile battery (lead-acid), being rechargeable and having a small salvage value. Except for a few shore aids, the use of secondary batteries with lighted aids to navigation was terminated in 1969. Occasionally 6-volt hotshot batteries (similar to 'D' cell batteries) are used to temporarily provide a source of energy to lighted aids.

Power Assembly Clamp (PAC)	A non-disposable holding device utilized to secure a power unit in a buoy pocket. The PAC weighs approximately 45 pounds.
Flasher (CG-181)	Watertight, solid state, electronic device that times the flash sequence, switches a circuit to operate the lamp for a pre-set contact time, regulates the output voltage so that within each sequence 12 volts are not exceeded, and upon sensing a burned out or defective lamp switches a circuit to operate the lampchanger so a new lamp is rotated into the operating position. The flasher weighs under 2 1/2 pounds.
Lampchanger (CG-6P)	A spring loaded, hand wound device with a turret that supports six lamps, only one lamp of which operates at any given time. Upon receiving a pulse from the flasher it lights the operational (uppermost) lamp for the duration of that pulse. When a lamp is burned out, the lampchanger's circuit is open and upon receiving a pulse from the flasher the lampchanger rotates a new lamp into the operating position. If the new lamp is operative, the system functions normally; if the new lamp is defective, the process continues until an operative lamp is found or the lampchanger has rotated the sixth and last lamp into the operating position.
Lamp (Marine Signal)	A source of light consisting of a filament (tungsten wire of high melting point that becomes incandescent when heated by electric current) that is enclosed in a glass envelope (bulb) preventing oxidation but enabling light radiation. Lighted buoy lamps are equipped with clear bulbs, type S-8 or S-11, and type C-8 helical coiled filaments. These lamps use 12 volts and come in six different sizes: .25 ampere, .55 ampere, .77 ampere,

TABLE III (continued)

	1.15 ampere, 2.03 amperes, and 3.05 amperes.
Lantern (155mm plastic 200mm glass)	An acrylic or glass optical (green clear, or red fresnel drum lens), that provides a watertight housing for all visual signal components. This is mounted on top of the cage. It refracts and directs all light rays from the lamp towards the horizontal direction to be observed as a red, green, or white light. The buoy lantern weighs no more than 8 pounds.
Daylight Control	A photoconductive device attached to the flasher that enables the flasher to control visual signal transmissions during periods of darkness. It is current policy to replace daylight controls at the time a power unit is replaced or every two years, whichever is less.
Rated Life of Lamp	The average number of hours that a batch tested particular type of lamp will burn at rated voltage before failure. The rated life of all lighted buoy lamps is 500 hours.
Rated Battery Discharge Time (RBDT) (days)	The RBDT is the expected total useful operating life of an activated battery or combination of activated batteries under a specific load and operating characteristic. The RBDT is established using battery ratings and the ampere-hour-per-day consumption of 12-volt lighting equipment for standard light phase characteristics. The consumption value includes allowances for surge factor, solid-state flasher regulator dissipation, and operation using daylight controls. The RBDT for certain locations is adjusted for environmental variances from standard conditions such as extreme temperatures, shaded daylight controls, and cloud cover.

TABLE III (continued)

Battery Shelf Life Period	The battery shelf life period is the amount of time that a battery or power unit may remain in storage without deteriorative action occurring to the point that the battery rating is reduced. The shelf life period commences upon departure of the batteries from manufacturer.
Battery Service Life	The battery life is the RBDT plus the battery shelf life period, or three years in operation plus the battery shelf life period, whichever is less.
Characteristic	The pattern in time of flashes of light alternating with eclipses of darkness exhibited by a light during one period.
Standard Characteristics	Characteristics in accordance with the International Association of Lighthous Authorities' Standards:
Fixed (F)	A continuous steady light.*
Flashing (Fl)	Showing a single flash at regular intervals; duration of light always less than duration of darkness. Not more than 30 flashes per minute.
Group flashing (Gp.Fl.)	Showing at regular intervals 2 or more flashes.
Quick flashing (Qk.Fl.)	Shows not less than 60 flashes per minute.
Interrupted quick flashing (I.Qk.Fl)	Shows quick flashes for about 5 seconds, followed by a dark period of about 5 seconds.

*Fixed lights are not used with buoys since they are uneconomical for battery powered aids, and not as conspicuous as rythmic lights.

TABLE III (continued)

Equal Interval (E. Int.)	Light with all duration of light and darkness equal.
Occulting (Occ.)	A light totally eclipsed at regular intervals, the duration of light always greater than the duration of darkness.
Morse Code - Mo. (A)	Light in which flashes of different duration are grouped in such a manner as to produce a Morse character A.
Duty Cycle	For a given characteristic, the ratio of the total time during which the flasher allows current to flow to the lamp during one period to the duration of one period.

Sources: COMMANDANT INSTRUCTION 10500.32A
1973 Light List, Volume III, Pacific Coast and Pacific Islands Ocean Engineering Report No. 37 (CG-250-37), "Visual Signalling: Theory and Application to Aids to Navigation," 22 June 1970.

Purchase Description No. 191A, "Primary Batteries for Aids to Navigation," 14 February 1974.

Purchase Description No. 181B, "12-Volt, Solid-State, Flasher for Maritime Aids to Navigation," 13 May 1968.

Purchase Description No. 195A, "12-Volt, Six-Place Lampchanger for Maritime Aids to Navigation," April 1971.

Purchase Description No. 234, "CG-234 Daylight Controls for Solid-State Flashers," February 1973.

Purchase Description No. 243, "Marine Signal Lamps," April 1973.

Purchase Description No. 205B, "Buoy Lantern for Maritime Aids to Navigation," March 1972.

to simplify maintenance and reduce the required number of spare parts, components, specifications, and prints. After many years of development efforts, the Coast Guard finally achieved significant design changes in 1962, which have culminated in higher levels of lighted buoy effectiveness, efficiency, and safety. These changes, known as the 1962 Buoy Standards, have enabled subsequent standardization of other buoy components.

2. Mechanical Chain Stopper for Buoy Tenders (1950's)

Although not a direct improvement to aids, the mechanical chain stopper was a major innovation for buoy servicing operations. This device which was adopted service-wide during the early 1950's, consists of a spring loaded mechanism mounted in the forward end of the buoyport of a buoy tender. Through positive reception of buoy mooring chain and easy disconnection when desired, the mechanical chain stopper has led to easier and more certain shiphandling during hazardous buoy servicing operations.[16]

3. Electric Power with Primary Batteries (1950-1969)

Although battery powered lighted buoys were first introduced in 1935, their superiority over acetylene gas buoys was not determined until the late 1940's. The decision to electrify all lighted buoys with secondary lead-acid batteries was made in 1950. While these batteries could be

[16] In 1950, LCDR Niels P. Thomsen, then Commanding Officer of the USCGC TUPELO, developed and built a prototype of the mechanical chain stopper. A Buoy Tender Manual, p. 62.

recycled eight times or more, the required semi-annual recharge procedures, consisting of returning exhausted batteries to support bases for unracking, recharging, and reracking, were many times the initial cost of the batteries themselves. Furthermore, the danger of explosion from gas accumulation inside a buoy body, previously encountered with acetylene gas lighted buoys, was lessened but not eliminated since lead-acid batteries emit explosive hydrogen gas. In 1962 the first experimental use of primary zinc-air batteries lead to a new era for lighted aids to navigation, as the primary batteries eliminated the massive and costly support requirements of secondary batteries. The initial cost of primary batteries was, incidently, slightly lower than equivalent secondary batteries. Primary batteries can be acquired with capacity combinations providing 1 to 3 years of power, enabling less frequent servicing of aids and enabling battery servicing to coincide with other component service periods. The danger of explosion from gas accumulation was also eliminated. By 1969, when use of secondary batteries was terminated, lighted buoys could be recharged with primary battery power units that weighed much less than the old secondary units. This weight reduction was sufficient to permit recharging of a lighted buoy with 1000 ampere-hour power units by small boat, thus providing new operational flexibility for servicing units. Although the dumping of primary batteries at an aid site was practiced initially, the Coast Guard since 1970 has taken a leadership role in

protecting the marine environment, and most of the damage done to battery powered navigational aid surroundings in the 1960's has been corrected. Appropriate procedures for disposing of primary batteries at suitable shore facility locations have been instituted; however, in some locations proper disposal is becoming increasingly complicated.

4. Standard Solid-State Flashers (1960's)

The decision to standardize light characteristics was made in 1966, as the hundreds of different flashers then in use required massive procurement and inventory procedures. Effective implementation of this policy has provided mariners with uniform and easy to identify visual signals. Because only twelve types of flashers are now generally in use, aids to navigation personnel have an easier task in selecting desirable power-equipment combinations.

5. Use of Radar Reflectors (1952-1962)

Until the 1940's when vessels and aircraft were commonly equipped with radar transceivers, buoy construction offering minimum wind resistance was desired. However, the ability to transit buoyed channels by radar during periods of poor visibility became a reality during the 1950's leading to a provision for basic radar reflectors in the 1962 Buoy Standards.

6. Replacement of Lightships (1960's)

As technology advanced during the 1960's, many lightship stations and their functions were replaced by

offshore platforms that were either manned by vastly smaller personnel complements or controlled remotely. Large Navigational Buoys (LNB) forty feet in diameter have replaced other lightships since the last offshore platform was built.

7. Servicing Remotely Located, Difficult to Service Aids (1960's-1970's)

With commencement of the Lighthouse Automation and Modernization Project (LAMP) in the late 1960's, efforts were initially made to automate remotely located, isolated, or difficult to support lighthouses. This effort has been largely successful. Coast Guard Aircraft have been used to service aids to navigation where aids are not easily accessable, in such areas as offshore islands.

8. Acrylic Lantern Optical Assemblies (1960's-1970's)

The first lenses used extensively for lighthouses were made of cut glass. This process was very expensive and eventually gave way to the less expensive pressed glass method. Pressed glass optical assemblies became common on most lighted aids to navigation even though the optical efficiency of cut glass was superior.[17] For many years the standard buoy lantern was made of pressed glass with an

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[17] While some larger size (order) cut glass (classical) lenses remain in service today, many of these masterpieces (primarily imported from France during the 1800's) have been preserved in museums throughout the United States. Augustin Fresnel (1788-1827) is credited with having developed large cut glass lenses by building separate ring prisms of glass. Eventually 9,000,000 candle power capability was attained through this method. Encyclopedia Americana, Volume 17, 1969, p. 506.

inside diameter of 200 mm. By introducing modern acrylic lenses into service, greater optical efficiency was regained because sharper corners could be molded into plastics than in pressed glass. While the 155 mm acrylic plastic lantern has been utilized as standard for lighted buoys since the early 1970's, some 200 mm glass lanterns have been retained in rough service locations encountering ice or breaking waves.

9. Procurement of Short Range Aids to Navigation Components (1960's-1970's)

Most aid components are peculiar solely to aids to navigation and must be specifically manufactured for the Coast Guard. Procurement is now primarily through one year term contracts with commercial manufacturers listed on the Coast Guard Qualified Products List (QPL). The Coast Guard after determining needs, writes detailed specifications for each product required then encourages companies to submit prototypes of the components to be produced for testing and evaluation. If specified standards are met, the manufacturer is placed on the QPL and becomes eligible to bid on a contract. Hopefully more than one manufacturer will have qualified for each product, thus allowing competitive bidding. When bids are solicited from the QPL, the Coast Guard guarantees a minimum number of items that will be purchased during the term of the contract. The manufacturing firm offering the lowest price is awarded the contract. Contracts are then utilized by the Brooklyn Supply Center (The Inventory Control Point for small SRAN components) to

procure desired numbers of components for inventory and subsequent distribution. Periodically servicing units order components, such as flashers, directly from the Supply Center to provide sufficient quantities of spare components to correct potential aid deficiencies in addition to meeting routine servicing requirements. Through competitive bidding of solid-state flashers the original price of $278.00 per flasher was reduced to $59.20 each in 1969, the current price being $69.30.

Because no interest exists in building steel buoys commercially, the Coast Guard Yard constructs buoys for the Aids to Navigation Mission. Once built, buoys are turned over to Headquarters Controlled Material (HQCM) for inventory control along with all other buoys on station or maintained under HQCM authority by support bases. Sinkers are generally fabricated locally by support bases.

D. AREAS WITH POTENTIAL FOR FURTHER DEVELOPMENT

1. Booz, Allen Applied Research Studies

As a result of studies concerning support and service systems, significant changes have been and will continue to be made in the Coast Guard Aids to Navigation System. Booz, Allen Applied Research, Inc., conducted this research during 1970 in three tasks:

"Evaluate plastic versus steel buoy hulls."

"Examine the tradeoffs between floating aids and fixed structures."

"Examine the servicing system, including facilities

ashore and afloat, considering possible changes in buoy material and buoy-structure mix."[18]

Based upon these studies, Booz, Allen recommended that the Coast Guard develop the SRAN Sub-system to include:

"Establishment of trained and mobile A-to-N teams for servicing actions that do not require lifting of buoys and moorings."

"Design and construction of specific new classes of boats and tenders and modernization of some existing tenders."

"Reduction of servicing schedules for all types of aids supported by an effective SANDS program and maintainability analysis."

"Use of minor marine structures instead of buoys wherever local conditions are favorable."

"Use of lightweight plastic buoys for all floating aids except those in icy conditions."

"Development and engineering to support the program."[19]

In addition the following essential initial projects were defined:

"Buoy-position device

Aerial photography

Discrepancy buoy and mooring

Tender modernization

Operating Manuals

District Operating Plans ..."[20]

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[18] Servicing System for Short-Range Aids to Navigation, Booz, Allen Applied Research, p. 1.

[19] Ibid., p. 1.

[20] Ibid., p. 7.

As a result of the Booz, Allen studies, much progress has been made in some of these areas.

a. Administration

Until 1972 there were hundreds of directives and publications issued by Headquarters prescribing Coast Guard internal policies and procedures to be followed in the establishment, development, maintenance, and operations of the Aids to Navigation System. In a complete revision and consolidation of the previous partially obsolete or redundant paper empire, the revised Aids to Navigation Manual is being issued. The manual is divided into four books and several appendices. Book 1, "Administration," was completed 17 May 1972 and has been amended through Change 3 of 1 August 1974. Book 2, "Seamanship," was completed 12 June 1973, and Book 4, "Radio Navigation." was subsequently issued. Book 3, "Maintenance," and Appendix D, "SANDS Manual," are still in the process of being developed, so certain portions of the 1964 version of the Aids to Navigation Manual remain effective. At the district level directives are promulgated to prescribe guidelines specifically meeting district requirements. Overall guidance is contained in the District Operations Plans.

Informal communications between Headquarters, field, and staff organizations and units are printed periodically by the Headquarters Aids to Navigation Division in "Aids to Navigation Bulletins." These publications include, among other items, articles about solving common problems, helpful hints

or reminders, innovations, and summaries, seminars, or surveys involving aids to navigation. A similar publication, "The Coast Guard Engineer's Digest," contains scientific and technological articles which occasionally feature aids to navigation.

b. Aids to Navigation Teams (ANTS)

As a result of the studies and subsequent favorable experimental evaluation, the Coast Guard has established several shore based Aids to Navigation Teams (ANTS). Two generations of related Aids to Navigation Boats (ANBS) have been constructed and delivered. The ANT concept is based upon the fact that much work being performed by tenders could be successfully accomplished by smaller, less expensive craft. Related to the implementation of Aids to Navigation Teams has been an ongoing effort to develop discrepancy buoys. Discrepancy buoys are lightweight lighted buoys that can be utilized by ANT units or other shore based units to temporarily correct lighted buoy discrepancies that would ordinarily require a tender to correct. Discrepancy buoys have been made in many different ways, primarily using small unlighted buoys as a platform. Eventually about seventy ANT units are to be established if the program continues to be successful.[21]

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[21]Aids to Navigation Bulletins: (Oct. 1971 - Mar. 1972) p. 19; (May - Dec. 1973) p. 28. Success appears probable. Actually ANT is a proven concept practiced as early as the late 1960's by buoy tender personnel as a direct result of reduced weight primary battery power units. Tender personnel using their own cargo boat or borrowing trailerized boats and vehicles from nearby stations, serviced aids including buoy power unit replacement.

c. Miscellaneous

Also of significance resulting from the studies has been implementation of the 180' Buoy Tender Modernization and Renovation Program, and the ongoing testing and evaluation of plastic buoys. The reduced frequency of servicing aids to navigation for other than discrepancy situations has contributed to cost-effectiveness. Progress towards attaining reduced frequency goals for routine visits is indicated in Figure 4. Most importantly the studies themselves have guided the Coast Guard into formulating policies that examine cost-effectiveness and consider alternative courses of action.

2. Sound Signals

During periods of low visibility, reliable sound signals may be the only warning provided a mariner approaching danger. Methods depending on wave action also fail to operate in dead calm seas. Attempts to power buoy sound signals have met with only mixed success. The following comments address this area most appropriately.

> "The ultimate in reliability is still beyond our grasp. We are searching for a highly dependable sound signal with the fewest possible moving parts and the least amount of circuitry. One that can sustain the shock of open water without failure, that is cheap and easy to maintain, and one that runs on the least amount of power. When this horn is developed, then bells, gongs, whistles and bell strikers will join the great amount of aids hardware already in historical limbo."[22]

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[22] "Buoy Tender Manual," p. 32.

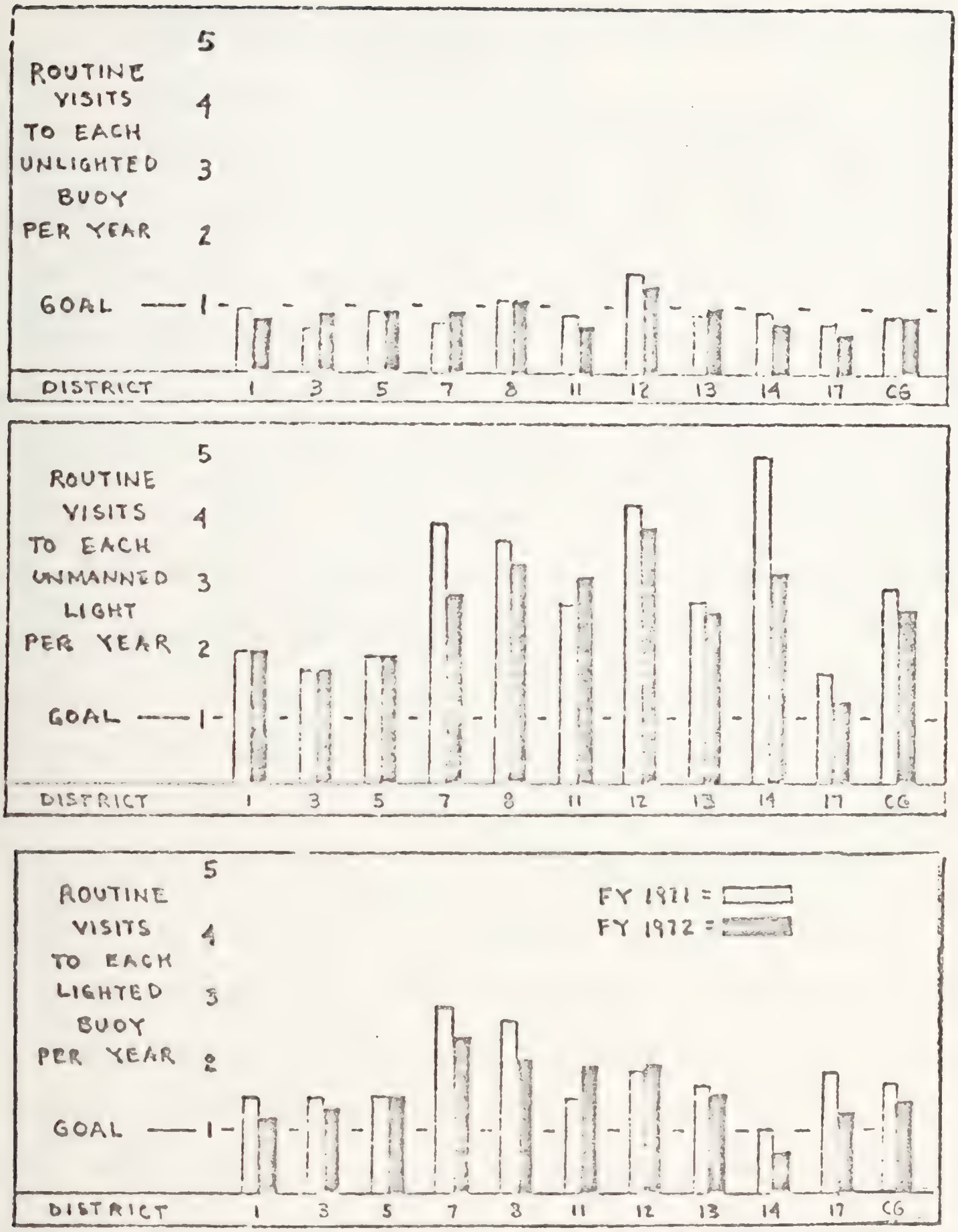
ROUTINE VISITS TO EACH UNLIGHTED BUOY PER YEAR
GOAL
DISTRICT
1 3 5 7 8 11 12 13 14 17 CG
ROUTINE VISITS TO EACH UNMANNED LIGHT PER YEAR
GOAL
DISTRICT
1 3 5 7 8 11 12 13 14 17 CG
ROUTINE VISITS TO EACH LIGHTED BUOY PER YEAR
FY 1971 =
FY 1972 =
GOAL
DISTRICT
1 3 5 7 8 11 12 13 14 17 CG

FIGURE 4

3. Multi-seasonal Use of Primary Batteries in the Ninth Coast Guard District

Since 1969, the servicewide use of primary batteries has provided for flexible and longer service intervals between routine power unit replacements. This has enabled actual operating conditions to be matched with potential battery capabilities. However, for several years full potential has never been realized on the Great Lakes (Ninth District), due to the seasonal operation of these aids to avoid ice hazards. In an attempt to obtain more effective use of power unit capabilities, the Ninth District decided to use batteries for second and third seasons provided the power unit in question met visual inspection, closed circuit voltage, and remaining capacity requirements. Because of interim stowage and handling problems associated with the extremely cold temperatures encountered in the Great Lakes Area during the winter, a tradeoff between potential battery savings and increased probability of battery failure for the ensuing season exists. Recently a smaller capacity battery of 600 ampere-hours that is currently used only with shore aids, has been placed on the market at a proportionate reduction of the cost of 1000 ampere-hour batteries. Should a corresponding power unit of 600 a-h capacity be developed, many buoys currently operating with multi-seasonal power units will be powered with one season units, hopefully resulting in greater battery consumption before replacement without an increase in probability failure.

4. Discussion of a Major Aids to Navigation Problem Area Involving questions of Coast Guard Liability Based on Buoy Positioning

The purpose of this discussion is to illustrate an additional approach toward improving buoy positioning accuracy. The position aspect of buoys is currently the subject of court litigation where judgements in access of $127 million dollars are being sought.[23]

a. Background

Normally under suits in Admiralty, the plaintiff stands to collect damages from the Federal Government if negligence in maintaining the Aids to Navigation System can be proven against the Coast Guard. Negligence can be in the performance of work or failure to correct a discrepancy. Two ways the latter category can be predicated include actual notice, discrepancies actually discovered or reported, and constructive notice, discrepancies not observed or reported but within the Coast Guard's purview to have been reasonably acted upon.

Once a buoy is established in a position delineating the limits of best water, this position information is given to appropriate agencies for charting. From then on buoys must be placed accurately on the charted position. Should bottom contour changes be detected and it is determined that a buoy is to be relocated, immediate dissemination of this information is required with Broadcast Notice to Mariners. Continuous advertisement in Local Notices to

[23] Aids to Navigation Bul. (May 73 - Dec. 73), p. 10.

Mariners is required until charts can be corrected to reflect the new location.

In essence the Federal Tort Claims Act exposes the Coast Guard to suit should a vessel collide or ground as a result of reliance upon a charted buoy. It is then up to the Coast Guard to prove that the system had been maintained in a reasonable manner. Unless a buoy's proper position can be proved, no assumption about subsequent movement by heavy weather can be made. Even if positioning was properly and accurately accomplished, mistakes such as reversed left and right angles discredit the competence of the Coast Guard for the entire operation.

The Coast Guard has put a major effort into alleviating this increasingly occuring problem. There are a multitude of procedures and instructions concerning buoy positioning and position reporting processes as these operations are precise and demanding. Because of uncontrollable circumstances, such as poor visibility, the most precise method or combination of methods available must be used to accomplish the task, even though these methods may not be the most preferred method. The comprehensive procedures and instructions include the following considerations:

(1) Buoy positioning instruments are properly calibrated and in a good state of repair. These instruments include sextants and other inherent systems aboard a servicing unit used to determine buoy positions such as visual bearings, radar ranges, and depth soundings.

Positioning with horizontal sextant angles combines simplicity with extreme accuracy; however, certain limitations such as poor visibility preclude their use at all times. A buoy's position can be defined with two angles obtained by using the sextant in the horizontal position instead of the usual vertical position. The left and right angles are determined from three objects - left and right objects using a mutual center object. The buoy's position and center object's location are defined where two imaginary circles intersect. Care must be exercised in selecting objects in order to avoid "swinger angles" (angles obtained from objects located such that the two imaginary circles approach overlaying one another.

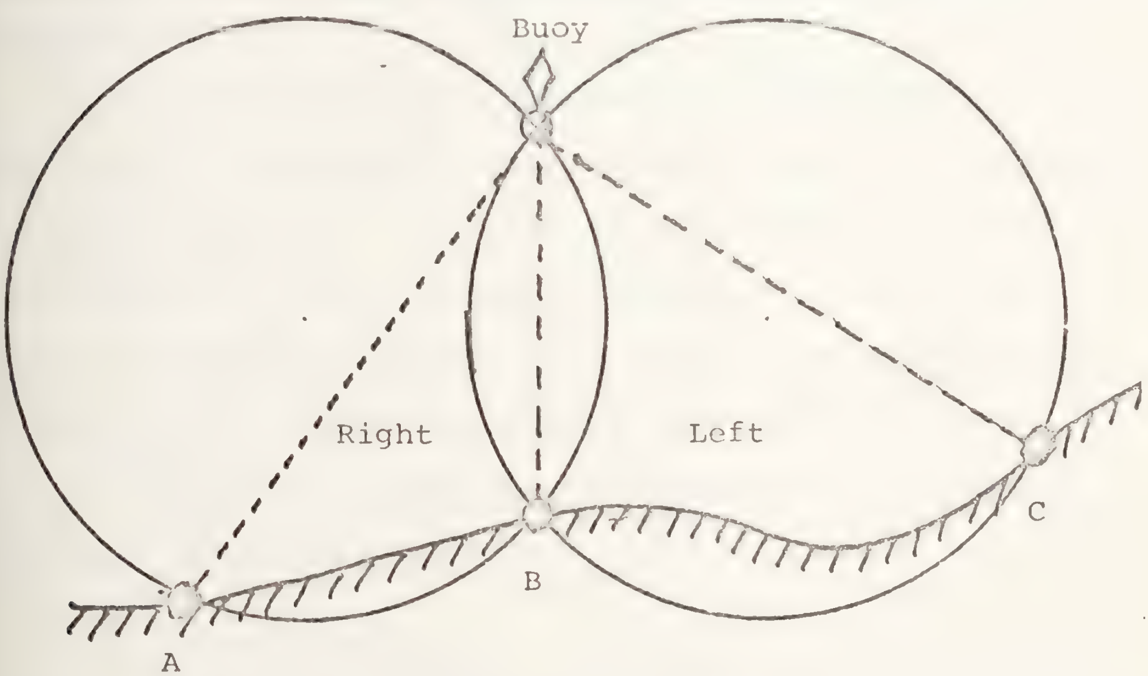

FIGURE 5

(2) The most precise means available are used in buoy positioning operations supplemented with additional angles, bearings, and ranges. Particular attention to quality of angles is important.

(3) Appropriate charts are fully corrected and accurate depth determination is obtained such as with leadlines (hand employed).

(4) Check that the buoy serves purpose intended (hydrography changes) when on charted position, and that all information in the Light List is accurate and up to date. A buoy found off station is either reset on charted position or promptly reported as off station.

(5) A continuous training and maintenance program to support the above.

In a separate effort, research and development work involving an electronic buoy positioning device or equipment is being conducted. One such system, costing $47,000 for one vessel, is to be tested in the future. In a special project, Commandant (GWAN) is attempting to develope new techniques to assist in accurate positioning of buoys.[24] It is a response to this endeavor that an additional approach is presented.

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[24] LCDR G. Clark (GWAN-1) is working on this project. In a recent Aids to Navigation Bulletin, LCDR Clark contributed a detailed discussion of gyro errors and their relationships to latitude and vessel speed, and resultant quality of visual lines of position (bearings). Aids to Navigation Bulletin (May 1973 - December 1973), pp. 31-34.

b. The Environment

When a tanker runs aground near a channel marked by Coast Guard buoys that were relied upon while transiting the channel, the potential legal implications are enormous. Besides structural damage sustained by the tanker there are the possibilities of loss of life, oil discharge, and blockage of the channel so that other maritime traffic is delayed. For this scenario, three alternative reactions are presented.

Definitions:

Buoy Reliability: the ability of a buoy to survive hazards, including component failures such that the buoy does what the Coast Guard intends for it to do 24 hours a day.

Charted Object: a light structure, tower, tank, spire, chimney, or any definite and distinct object that is accurately located on a chart for buoy positioning.

Assumptions:

(1) The continuing need and therefore use of buoys to accomplish SRAN Mission goals.

Justification:

(a) Booz-Allen conclusion which takes into account the economics of minor light structures versus buoy flexibility resulting in total numbers of buoys that are essentially stable for the foreseeable future.

(b) Need for temporary aids.

(c) Future adoption of plastic buoy hulls and solar energy as a power source will not alleviate the need for buoys.

(2) The cost to operate and maintain buoys will be no less in the future than in the past.

Justification:

(a) Revised lower cost servicing schedules and procedures reflecting greater reliability of aid components and the Booz-Allen studies are already in effect.

(b) Inflation.

(c) Energy crisis.

(d) Personnel - ending of the draft has led to sharply higher recruiting costs.

(3) Buoy component reliability will be at least the same in the future as in the past.

Justification:

(a) Signal Engineers and technological personnel will continue to make major contributions in this area. The solid-state flasher is an example of the progress already accomplished in component reliability.

(b) Continued strong QPL standards and procurement control.

(4) Overall buoy reliability will be at least the same in the future as in the past.

Justification:

(a) Overall weather conditions will average out the same in the future as in the past.

(b) Increased Professionalism - The Coast Guard will continue a fairly successful effort in training personnel and maintaining traditional buoy position apparatus in an acceptable state of repair. As a result, there is no reason to believe that the use of wise and prudent selection of available objects or sextant angles and accurately adjusted apparatus will not continue to result in sufficient expertise with sextant use, plotting positions, and buoy seamanship proficiency. The Aids to Navigation School, Manual and Bulletins will contribute to this effort.

(c) High personnel turnover rate - this is a negative factor that to some extent can be overcome by increased professionalism. Although high turnover among personnel is undesirable because learning capabilities are usually never developed to full potential, it is somewhat necessary in view of the Coast Guard's ten separate missions and significant amount of isolated duty stations. The ending of the draft has also raised questions about the quality of present day recruits. While it is assumed that CG personnel habits will not so change, and thus personnel errors will be related to a high turnover rate.

c. Alternative 1 - Management Approach

This approach will eliminate the implicit assumption that objects used to determine buoy positions are actually located as charted. Although extremely uncommon, chart production errors not detected and surveys of objects charted that were not conducted or recorded accurately can lead to buoy positioning errors. This factor has been a major issue in one of the largest pending suits against the Coast Guard. Furthermore, it will be assumed that those objects used for positioning buoys are not always of high quality or available in sufficient number or location. Thus within budget and time constraints and under the assumptions already stated, there is the opportunity to improve upon charted objects that are relied upon for important buoy positioning functions. The following areas are considered within the realm of the Coast Guard.

(1) Servicing units are able to identify and report on objects that are used by necessity even though their charted position may be suspect, as well as potential objects of high quality already in existance but not charted.

(2) Servicing units can identify and in some convenient cases directly improve upon objects in need of enhanced visibility by use of reflective materials or brush clearing similar to the manner in which shore aids are maintained. In some situations, due to inaccessibility or property restrictions, servicing units will require high

level assistance in obtaining approval and affecting desired object visibility improvements.

(3) In some locations available charted objects are insufficient for buoy positioning purposes. Were servicing units able to identify these areas, high level authority could look into the possibility and verify the need for creating new objects in view of deed or easement restrictions.

(4) In rough service areas, where aids of rugged components have a consistent history of not being able to survive hazards of the environment for entire season, consider going to seasonal operation similar to the CG Ninth District facing ice hazards each winter.

(5) In those areas identified as particularly vulnerable to claims litigation due either to marine traffic patterns or court trends, consider an intensive effort in applying this management approach.

d. Alternative 2 - Technological Approach

Conceptually this approach would involve the development of an accurate positioning device. Such a device would have an advantage over the management approach by being effective during periods of poor visibility. However, the cost of such a device or system of devices might become constraining. A system costing $47,000 for one vessel, that was requested in the Fiscal Year 1975 Budget, was eliminated due to other priorities.

e. Alternative 3 - Aerial Photography

This method, which was presented in the Booz, Allen Studies as a project for consideration, could help alleviate buoy positioning problems, but primarily from a defensive point of view. Such a technique, appears to be well suited for areas well defined, such as rivers, that have been the place of previous or current claims and litigation.

f. Summary

Of the three alternative approaches discussed, primary emphasis has been placed upon the Management Approach since it is believed that certain areas of this method could be easily implemented at a relatively small cost. The real problem presented, which would require extensive analysis to evaluate thoroughly, is determining what it would be worth to the Coast Guard in a Risk-Return tradeoff comparison to effectively implement each alternative. It is left for further study to determine the estimated cost of each alternative, and compare this with the expected benefit to be realized as a result of decreasing probabilities of buoy positioning failures, and thus potential claims and litigation.

E. A PROJECTION

The Coast Guard is in the midst of continuing Aids to Navigation evolution. While possible, the complete extinction of buoys in the future appears remote. More likely

the future may see long service life buoys equipped with solid-state components, indestructible moorings, and long life Flash Tubes. Moreover, these lightweight heavy duty buoys may be accurately positioned anywhere by a special device and powered indefinitely by solar energy.

III. DEVELOPMENT OF MODIFICATIONS TO THE AIDS TO NAVIGATION MANAGEMENT INFORMATION SYSTEM

A. INFORMATION NEEDS IN THE AIDS TO NAVIGATION AREA

The Simplified Aids to Navigation Data System (SANDS) is the present information system for the Aids to Navigation Mission. SANDS was implemented on a partially operational basis during the mid 1960's. Utilizing the advancing technology and spectacular growth in the use of electronic computers characteristic of the period, it was specifically designed to reduce the number of reports required, enable easier preparation of those reports retained, and to provide more and better information than previously available.

Because of the importance of the Short Range Aids to Navigation Sub-system in promoting safe and economic maritime navigation, short range aids have to be developed, operated, and maintained within high levels of reliability for prolonged periods and sometimes under adverse circumstances. In order to satisfy this general need of the public adequately, Coast Guard personnel involved with Aids to Navigation duties require an information system that generates a rapid flow of wide varieties of developed information suited for all levels of management in carrying out their particular functions. The functions can be divided as follows:

- Operations and minor aid maintenance of servicing units.

- Heavy hardware stowage and major buoy maintenance support of bases or depots.

- Inventory and distribution of SRAN components by the Supply Center.

- Procurement and development of aids and aid components by Headquarters and District technical staffs.

- Construction of aids to navigation boats and buoys by the Yard.

- Training of personnel by the Aids to Navigation School.

- Budget presentation by aids to navigation Program Managers.

- The overall supervision, assignment of responsibilities, and policy formulation of Headquarters and District Aids to Navigation staffs.

Of primary importance to the effectiveness of aids and usefulness of the information system are the prevention, early detection, and correction of aid deficiencies known as discrepancies; such as buoys not on charted position and lighted buoys that are extinguished. Most critical are discrepancies involving aspects of an aid that may confuse or mislead the mariner into situations where the non-functioning aid is more dangerous to navigation than no aid at all. In these cases, immediate information dissemination and corrective action within 24 hours is usually desired, as well as any other considerations deemed appropriate. The effective coordination of the different aids to navigation functions is essential in successfully responding to and reducing discrepancies.

Administrative personnel and program managers need information about aids and aid systems in order to

continually review their effectiveness in meeting both the needs of the mariner and budget constraints, their justification as a necessary part of the overall system, and their maintenance and operation in conformance with established policies. Information is used by administrative staffs to coordinate aid responsibility assignments and maintenance schedules among servicing units. Procurement and technical personnel need special types of information relating to aid performance in order to evaluate the best types or combinations of types of equipment. This task is complicated due to the complex and peculiar characteristics of most aid components. Yard personnel have need for similar information about buoys and the performance of aids to navigation boats. The Aids to Navigation School utilizes information with regard to personnel errors to emphasize training against such mistakes in the future. In order to correct and prevent discrepancies, operating units need the support of logistics units to insure a sufficient supply of spare equipment and components is on hand or readily available to meet potential discrepancies as well as routine servicing requirements. Because of the uncertain nature of discrepancies, timely information about hardware replacements is important to supply managers in attempting to determine desirable purchase quantities. In carrying on aids to navigation operations, personnel of servicing units have, almost without exception, been kept fully occupied in doing their job. These duties have left little

if any time for intensive review of each aid or groups of aids under their responsibility. This is rightly so, because the Commanding Officer and other key personnel of a buoy tender, for example, spend many long hours on the bridge, buoy deck, or in the engineroom doing their jobs while engaged in hazardous operations near dangerous waters. One mistake such as a navigational one and operations are over. Thus the information system should enable servicing personnel who complete and review the work report to do so accurately within time constraints. Moreover, the information developed from the system should help servicing personnel in maintaining and operating their aids, and where possible prevent aid discrepancies due to oversights.

In describing specific provisions of the SANDS System in 1970, Booz, Allen indicated:

> "...a fully operational and adequately funded and staffed program should provide for:
>
> Verification and refinement of planned servicing intervals, scheduling of optimum unit servicing trips by keeping track of expected component life on each aid planning of material requirements, and allocation of support facilities for the servicing of A-to-N equipment;
>
> Analysis of the A-to-N system in order to assess the reliability of the system and individual aids and aid components within the system, evaluation of alternative mixes of aids, and review of the support system requirements;
>
> Accurate identification and inventory of A-to-N equipment, and accurate and timely cataloging of aids for both internal Coast Guard use and external use by mariners, charting agencies, etc.;
>
> Input to simulation model of the A-to-N system;

Identification of weak areas where research and engineering emphasis should be concentrated."[25]

B. THE PRESENT SYSTEM

The Aids to Navigation Work Report (CG-4429), which is the basic source of raw data, is prepared by Coast Guard units at the scene during the time an aid is serviced. The present content and format of the work report has remained essentially unchanged since its inception. Required information includes the description and condition of an aid, reason for the work, work performed, and component, equipment, and aid inventory information. In addition to providing information, this report becomes a legal and historical record of the aid and, as an official document, the Aids to Navigation Work Report can be admitted as evidence in a court of law.

A detailed discussion of the present work report assumes some familiarity with its format. A blank of the present Aids to Navigation Work Report, revised May 1969, is provided as Figure 6 for this purpose.

Instructions and codes used in preparing the Aids to Navigation Work Report are contained in Appendix D to the 1964 Aids to Navigation Manual (CG-222). Appendix D, which is referred to as the SANDS Manual, also provides rules and reference material for operation of the entire SANDS System. The work report is formed with an original and two

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[25] Servicing System for Short-Range Aids to Navigation, p. 74.

DEPARTMENT OF [illegible]
TRANSPORTATION
U. S. COAST GUARD
CG-4429 Rev. 5-69

AIDS TO NAVIGATION WORK REPORT

(DO NOT TYPE)

PART I

1 AID NAME	2 AID CLASS	3 AID DESCRIPTION (Basic, Additional Data)	4 LIGHT LIST
1 2 3 4 5 6 7 8 9 10 ... 24 25		... 41 42 43	46 47 48 49 50 51

5 AID IDENTIFIER	[illegible]	8 [illegible] (Primary, [illegible])	9 BUOY SERIAL NO
67 68 69 70 71 72 ...	17 ... 22 ...	... 41 42 43	45 46 47 48 49 50 51

10 LIGHT (Char, Color)	11 LAMP	12 OPTIC	13 [illegible]	14 [illegible] (Type, Serial No)	15 FLASHER (Type, Serial No)	16 RESERVED
1 2 3 5 6	8 9	...	...	... 29 ...	... 40 41 ...	45 46 47 48 ...

17 FOG SIGNAL (Char, Type, Serial No)	[illegible] (Serial No)	BOTTOM	[illegible]	[illegible]	[illegible]
1 2 3 5 6 8 ...	... 24	... 29 ...	...	... 45 46	...

PART [illegible]

Card column 1

1 Routine	[illegible]	[illegible] Number
2 Seasonal Change	4 [illegible]	

Card columns 3-5

[illegible]	[illegible]	[illegible]	[illegible]
34 [illegible]	[illegible]	[illegible]	[illegible]
15 Damaged	[illegible]	[illegible]	99 Other

Card columns [illegible]

00 Normal	[illegible]	[illegible]	[illegible] personnel error
25 [illegible] Broken Moorings	[illegible]	[illegible]	[illegible]
35 Collision	[illegible]	[illegible]	99 Other

Card columns 11-34

00 Checked Inspected	[illegible]	[illegible]	43 [illegible]
44 Cleared	[illegible]	[illegible]	48 [illegible] Fluorescent
49 Painted	[illegible]	[illegible]	[illegible] tappers
54 Reset on station	[illegible]	[illegible]	58 [illegible]
59 [illegible]	[illegible]	[illegible]	[illegible]
64 [illegible]	[illegible]	[illegible]	[illegible]
70 Established	[illegible]	[illegible]	99 Other

PART [illegible] DATA

81 Work performed by (card columns 35-39)		[illegible]		[illegible] (Card columns [illegible])	
84 CG informed discrepancy [illegible] Julian Date / Hour		[illegible] Card columns [illegible] Julian Date / Hour		[illegible] Time spent [illegible] site (Card columns 59-60)	
87 Reason for delay if any (card column 61)		[illegible] (card columns [illegible])			

PART [illegible] POSITION

RIGHT OBJECT	RIGHT ANGLE	YARDS	DEGREES TRUE
CENTER OBJECT		FROM CHARTED OBJECT	
LEFT OBJECT	LEFT ANGLE	DEPTH OF WATER (FEET)	CHART NUMBER

REMARKS

SIGNATURE

PREVIOUS EDITION MAY BE USED

DISTRICT COPY

copies with interleaved carbons. At the time an aid is serviced the aid description, characteristics, and components are entered by hand where applicable, using direct reading codes from the SANDS Manual.[26] Normally only changes in this information need to be entered as this data is preprinted based upon the last report. If an aid requires servicing more than once within a short period, the preprinted new form most likely will not be on hand, and all of this information must be filled in. The work reason, work completed, condition of an aid, and cause of condition are entered using check marks. Servicing data, aid position, and general remarks are completed in long hand. Upon completion and signing of the report, the original is forwarded promptly by mail to the District Aids to Navigation Branch Office. The first copy is to be filed by the unit with primary responsibility for the aid, usually the unit that serviced the aid. If a secondary unit serviced the aid, the first copy is forwarded to the primary unit. The second copy is to accompany repairable defective components returned to a support base or depot. If the second copy is not so used, the SANDS Manual indicates it is to be destroyed.

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[26]To describe an aid's characteristic in Part I, Item 10 for example, the number code "404" is used to indicate a flashing light of 0.4 second duration, showing a flash every 4 seconds. This description is referred to as a FL4(0.4) characteristic. The letter "G" indicates that the color of the light is green.

Aids to Navigation Work Reports received at district offices are reviewed and, if required, returned to units for appropriate verification or correction. Data from certain portions of each work report are entered onto punched cards, which are identified as updating cards or work performance cards. At the end of a month, the cards are divided into two categories and forwarded to Commandant Data Systems Division (GCDS). Transactions cards are made up of routine updating cards and work performance cards, while correction cards are previously transmitted transaction cards that have been corrected. Commandant (GCDS) edits and processes the cards, revising the Headquarters Master Record File. Data not conforming to SANDS Manual codes and procedures are rejected and turned over to Commandant Aids to Navigation Division (GWAN) who has overall responsibility for the operation of the SANDS System. Rejected data are reviewed and may be returned to District Commanders for correction

Quarterly, and Aids to Navigation Assignment List (CG-4500) is prepared and used locally by District Offices. This list contains unit schedules for servicing, recharging, and relieving aids assigned to them. It is used as a tool in revising schedule dates in consideration of emergencies and unscheduled trips. Annually, at the end of March, the Aids to Navigation Assignment List is prepared for and sent to primary and secondary servicing units and a copy is

forwarded to Commandant (GWAN). This list serves as a catalog responsibility list and authorized equipment list for each servicing unit, as well as a complete listing for secondary units in the case of emergencies.

The Quarterly Report of Operation of Aids to Navigation (Program 03844C) is designed to produce periodic aid inventory reports and certain aid servicing statistics. This report is prepared at Headquarters utilizing SANDS master and history files, and may be run for any time period that is designated to the program by a control card. Results of the program are divided into four tables that contain information for each district followed by a summary for the entire Coast Guard. Table I includes aid inventory information for each basic type of aid including a total for the beginning of the period selected, number established and disestablished, and a total for the end of the period. Table II reports an analysis of work performed, aid operations including the number of visits to each type of aid, and the total and average time on site for the period selected. Table III examines visit information and separates visits into routine and discrepancy classifications. Discrepancies are further divided into three categories: 1) reported-found to be actual, 2) reported-found to be false, and 3) discovered by the reporting unit. Table IV provides similar information to Table III but excludes environmental hazards such as weather, ice, collision, and vandalism. The Quarterly

of Operation specifically emphasizes visit information in order to examine the impact of servicing policies in reducing the cost of maintaining and operating aids.[27]

Special SANDS inventory information (SANDS Inventory Utility Program) is available from three data sources, Headquarters Master File (Program 03824C), Headquarters History File (Program 03828C), and District Terminal Master File (Program 03836C). This additional information developed from the SANDS System similarly to the Quarterly Report of Operation, may be used as a guide for supply and support units, engineering personnel, and any other personnel with duties related to Aids to Navigation. Thus personnel responsible for primary battery management, the Power Section of Commandant Ocean Engineering Division (GEOE), might desire information pertaining to primary batteries.

Figure 7 depicts the flow of data and information in the present SANDS system.

Since its original implementation only minor permanent changes have been made to the SANDS reporting system. The following lists contain dates and substance of those changes applying to the Aids to Navigation Work Report and the SANDS Manual

<u>Aids to Navigation Work Report Changes</u>

March 1967 The report form was changed to reflect transfer of the Coast Guard to the Department of Transportation.

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[27] Operating Instructions for Quarterly Report of Operation of Aids to Navigation (Program 03844C), pp. 1-4.

Aids to Navigation Management Information System for United States Coast Guard

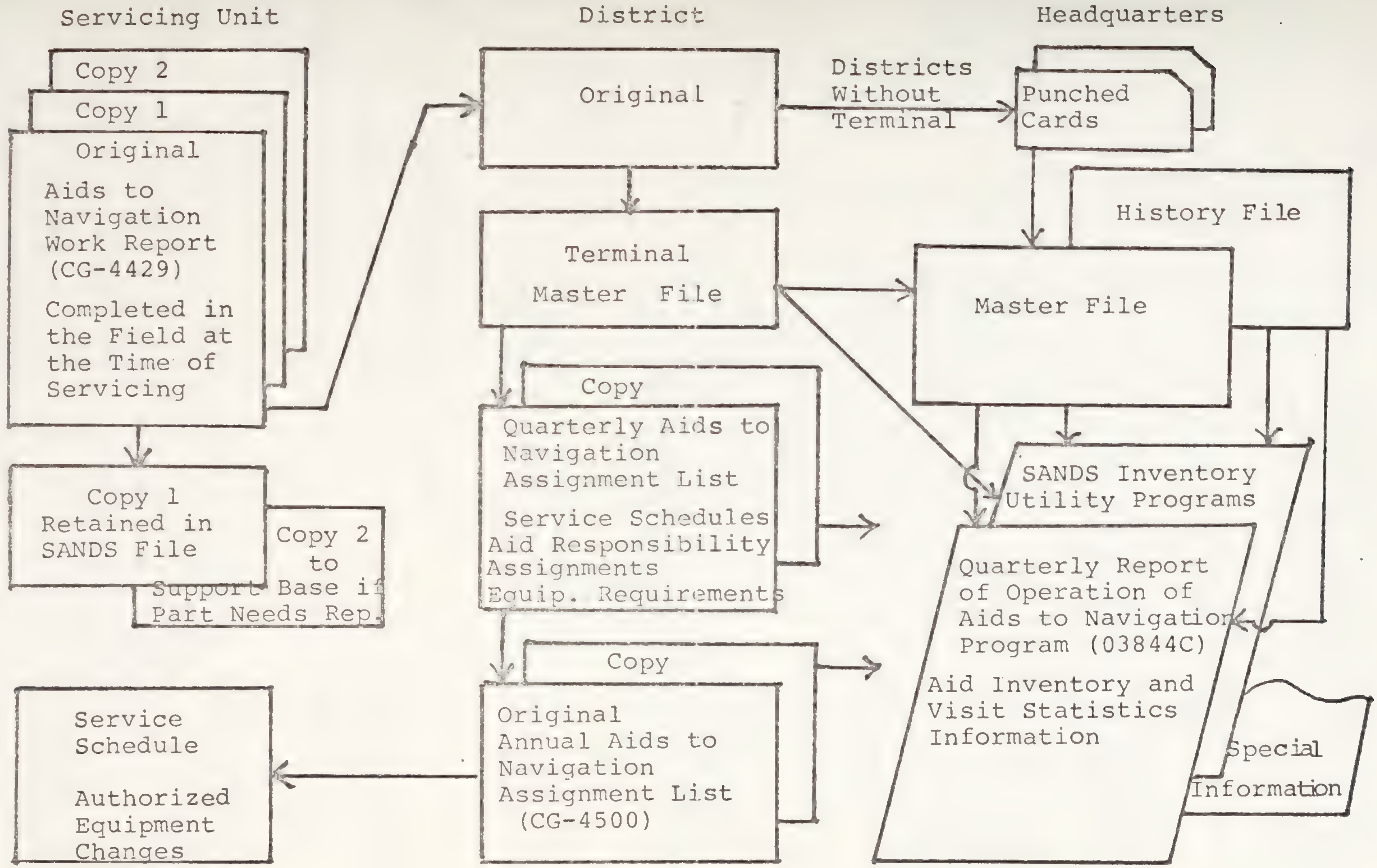

FIGURE 7

May 1969	Block 83 of the report form, "Primary Cause of Failure" was modified so that an entry here was required "for all discrepancies" in lieu of "for equipment only."
	Provision was made for entering a Fog Detector type and serial number.
	Provision was made for a separate entry to include Bottom Description characteristic, and the charted depth of water.
July 1971	Use of Block 30, Part I, was eliminated because the risk level classifications (Urgency Codes) generated by an aid non-functioning were determined to be unrealistic. These classifications reflected The Shore Units Plan (CG-380) and consequently were designed solely as guidance for shore units in maintaining aids closeby.

SANDS Manual Changes

18 Mar 1968	The Manual was amended to reflect changes in the distribution of the completed report and give instructions on standby or duplicate components that would require use of a second work report set.
26 Sep 1969	The Manual was completely revised to correspond to changes in the work report and update new codifications for recent additions of navigational aid hardware.

C. AREAS FOR FURTHER DEVELOPMENT

In addition to the comments about the SANDS System previously described, Booz, Allen reported in their 1970 studies:

> "SANDS is a management information system that has been partially operational for over 3 years. The system was developed by the Coast Guard to assist its managers and operators in the persormance of their A-to-N responsibilities. SANDS is a necessary and workable system. However, its full potential has not been realized, primarily because of delays in installation of proper computer facilities at both District Offices and Headquarters and a lack of trained personnel and financial resources.

With support from higher levels of management, including the availability of adequate funds and trained personnel the SANDS Program could be developed into an effective management tool."[28]

As a result of the Booz, Allen studies and subsequent evaluation the Coast Guard determined that:

"The increased reliability of buoy components has made the probability of an aid discrepancy due to equipment failure in less than 12 months very small. Analyses of buoy discrepancies have shown that the more frequently buoys are visited, over and above that dictated by sound engineering maintenance practices, the higher the probability of a discrepancy. Some causes of buoy discrepancies can be prevented by routine maintenance, however, discrepancies which are caused by uncontrollable events such as weather, collisions, vandalism, etc., cannot be prevented by routine visits. Routine maintenance, therefore, has an impact in the prevention of only certain types of discrepancies, and visits to buoys for unnecessary component inspections can no longer be justified in view of the costs associated with such visits."[29]

1. An Experimental Aids to Navigation Work Report

In connection with this policy change, the Quarterly Report of Operation of Aids to Navigation was developed to closely analyze servicing visits and related procedures. The program is well designed for this purpose; however, the usefulness of the information generated is limited by the present deficiencies in the SANDS reporting system. Supporting this contention is the fact that an Aids to Navigation Work Report form with major revisions is currently

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[28]Booz, Allen Applied Research, Inc., Servicing System for Short-Range Aids to Navigation, pp. 73-74.

[29]This passage was contained in COMDTNOTE 3261, 31 July 72, which was officially cancelled when its basic content was included in Book One, "Administration," Aids to Navigation Manual (CG-222-1).

being used on an experimental basis in the First Coast Guard District. This form features a plain language format in lieu of partial coding used with the present report. Some check boxes are included to enable easier preparation. Inspection and service note areas have been added so hand written messages can be computer printed on subsequent forms. A general comment area has been retained. Probably the most significant change is the addition of last date, projected date, and service interval used spaces for various types of services to be performed. Where scheduled dates are listed in Julian date format in the present report, these and other dates are in month, year format in the experimental form. On the revised form certain sections are different in the unit and district copies, such as the last date, projected date and service interval used spaces which appear only on the unit copy.[30]

While the Quarterly Report of Operation is being used to meet most administrative, engineering, and supply personnel needs, at the present time only the Annual Aids to Navigation Assignment List is being used on a regular basis to feed back information to servicing units. Briefly, servicing units get back from the system what they put in along with any predetermined equipment authorization changes. Since the routine servicing frequency of aids has been

[30] Aids to Navigation Bul. (May-December 1973), p. 4.

extended while the feedback information provided to servicing units has remained limited, a special information system, which would monitor SANDS data and feedback to servicing units information found to be questionable about aids under their responsibility, seems to hold much potential. Thus, simple oversights could be detected and potential discrepancies or unnecessary waste of aid hardware could be avoided. The chances are good for reducing the overall number of visits to a particular aid so monitored. This special information system would be most useful in monitoring lighted buoys because they present the most opportunities for non-functioning.

Although the present SANDS System is working and provides ample information to most personnel, full potential has yet to be developed. This is understandable since the system has been in operation for less than 10 years and the Coast Guard has been faced with budget constraints in developing the Management Information System.

2. <u>Examination of Present Aids to Navigation Work Report</u>

Since the work report serves two very important functions, as a primary data source and a legal record, its format and content must be designed to meet both objectives. In addition SANDS files provide an effective management tool for operating units, especially those using the remarks section for their own use. Taking into consideration the author's familiarity with the present form from past experience an attempt was made to identify common errors or omissions in required information on the SANDS Report. For this purpose

reports for 25 lighted buoys from the Thirteenth CG District were examined. The reports were for calendar year 1972-1973. Because most work reports in the Thirteenth District included extra information in the general remarks section, such as closed circuit battery voltage readings, they were judged to be at least as complete as the average report completed in the Coast Guard. This data sample consisted of a total of 79 visits to service aids, consequently 79 work reports were examined. A detailed listing of the errors detected is contained in Appendix B; a brief summary of the major types of errors is provided in Table IV.

TABLE IV

Summary of Major Types of Errors Detected in 79 Work Reports for the 13th CG District 1972 - 1973

Absolute Frequency	Type of Error
14	Missing entries
14	Incomplete entries
6	Incompatible entries; content errors
5	Incorrect entries; used wrong codes, checked wrong blocks, redundant entry
39 Total	

Since there were a total of 39 errors observed, there was an average of one error for each two work reports examined. In some cases up to three errors were noted in the completion of one report. While only some of the errors would result in erroneous information in the Master Record File maintained at Headquarters, all errors and inconsistencies would tend to discredit the Coast Guard should the report be produced as evidence in a court.

In assessing these results it must be noted that it is extremely difficult to interpret information that is inconsistent or incomplete, especially when examined after a year or more has elapsed. An attempt was made to resolve those entries or lack of entries in question through discussion with the Thirteenth District Aids to Navigation Office. In a few situations where the inconsistencies could not be resolved, the information presented reflects the author's opinion, with due consideration being given to the overall nature of the report and any comments in the remarks section.[31]

Errors frequently encountered involved the indication of component replacement in the aid description section while replacement of the component in the work performed section was left blank (unchanged) or vice versa. Other entries or missing entries appeared to be simple oversights. Some errors could be directly attributed to the use of SANDS

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[31]These procedures were also used in verifying or determining the data processed throughout this project.

Manual alphanumeric "direct reading" codes which have little association with the type of data they represent. For example, the code '47', meaning primary cause of failure was the lampchanger, was used by mistake for code '46' meaning the flasher was the primary cause of failure of an aid.

3. Important Information not Being Provided For with the Present Work Report

Several types of important information are not being provided for in the content of the present work report. For power units or batteries there is only a scheduled recharge data. This information was adequate when the present form was first implemented because secondary batteries, predominantly in use then, were normally recharged every six months. With the permanent change to primary batteries in 1969, power units were used with various lamp and flasher characteristic combinations for flexible periods of up to three years. Thus, there is a need to indicate the last recharge (replacement) date and the service period used. This interval, which is the expected total useful operating life for a primary battery or combination of primary batteries, is referred to as the Rated Battery Discharge Time (RBDT).

In many cases it was extremely difficult to determine the reason a component was replaced because the present form does not provide for such indication. Exceptions to this problem occur only when a particular component replaced is also the aid's primary cause for failure or, when amplifying replacement comments are entered in the remarks section.

Of the work reports examined, a substantial number indicated the loss of components during servicing or the salvaging of buoys previously washed ashore during a storm. This information, which is optional, was entered in the remarks section. By providing for uniform recording of this information, better analysis of aid hardware consumption and performance can be attained.

D. SUGGESTED IMPROVEMENTS

1. Aids to Navigation Work Report Modifications

Many of the SANDS errors detected can be reduced or avoided, and additional desirable information can be included by redesigning the Aids to Navigation Work Report.

a. Power Units (Batteries)

It is projected by COMDT (GEOE) that batteries will account for over 2.5 million dollars in expenditures during Fiscal Year 1975. Most power units and batteries are purchased directly by servicing units and bases from McGraw Edison Company and Union Carbide Corporation. Batteries come preactivated or are activated using prepackaged electrolyte at the time they are placed in service. Because of recent problems with the user-activated variety, increased use has been made of the preactivated type, which now comes in transparent cases. Batteries begin deteriorating while on the shelf and thus a 12-month maximum storage period has been designated to preclude retention of batteries beyond the expiration of their specified shelf life. Once placed in

service "all batteries shall be capable of providing sufficient voltage for a period of three years or RBDT, whichever is less, starting from the end of recommended shelf life, without maintenance, providing the electrical loading characteristics ...have not been exceeded."[32] The average in-service failure rate of batteries and power units is not to exceed 5% per year. Because power units and batteries are particularly vulnerable to manufacturing errors, strict quality control testing and procedures are specified. In order to disseminate the necessary information required by units in servicing aids and obtaining an accurate RBDT for each assigned aid, Commandant Instruction 10500.32A (Primary Batteries for Aids to Navigation) was promulgated. This directive consolidates applicable sections of the Battery Specifications (GEOE Purchase Description 191A), Flasher Specifications (GEOE Purchase Description 187B), and Visual Signalling (GEOE Report CG-250-37). By redesigning the present Aids to Navigation Work Report this valuable information could be readily recorded and fully utilized:

(1) Because the present form does not indicate when the aid was last recharged and the RBDT used, if the scheduled recharge date is calculated in error it is likely that either the batteries will be replaced unnecessarily early or the batteries will be exhausted when normally due and result in unexpected discrepancy visits. It is essential

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[32] Purchase Description No. 191A, "Primary Batteries for Aids to Navigation," Office of Ocean Engineering, U.S. Coast Guard, paragraph 3.15.4.

to know the last date of replacement because the RBDT can be automatically determined for any specific power capacity, lamp, and characteristic combination. For power units and batteries it would also be desirable to indicate the source of the information used in determining the RBDT because of policy changes regarding safety or correction factors and occasional equipment changes.

(2) It is normal procedure to check a battery's condition by visually inspecting the vital parts such as carbons, zincs, and breathing apparatus, and by taking measurements such as closed circuit voltage readings. If space were provided for this information on the report form, expected life curves of actual battery performance in the field could be obtained for various operating conditions. While most units apparently take such readings, they are not generally being recorded.

(3) The experimental Aids to Navigation Report Form, developed as a result of the research by Booz, Allen and subsequent determination by the Coast Guard leading to present testing in the First Coast Guard District, allows for some of these changes. Space for entries for last date of battery replacement, interval used (RBDT), and projected date of replacement are provided on the new form. However, the district copy must also contain this information if batteries or power units are to be monitored by data processing.

b. Lampchangers

The number of successful changes or rotations performed by a lampchanger are possibly more important to its useful life than time in service. However, at present no recording is being made of these successful changes although the information is readily available. Usually the standard CG-6P Lampchanger is left in the #1 position, which has a red mark. If upon the next visit the operating lamp is found normal in the #5 position, 4 successful changes were executed. If this lamp is burned out, 4 successful changes and 1 unsuccessful change were performed.

c. Reason for Replacing Component

Probably the most difficult information to determine from the present work report is the reason a particular component was replaced. In many cases the primary cause of failure has nothing to do with another component being replaced. By providing for the recording of this information more accurate analysis of component usage and consumption could be obtained. According to an article appearing in the Aids to Navigation Bulletin,[33] COMDT (GEOE) has determined that a significant number of flashers and lampchangers were erroneously being replaced at the expiration of their two-year warranty period. If component replacement reasons were indicated on the work report, misperceptions of replacement policies could be readily identified.

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[33] Aids to Navigation Bulletin (December 1972 - April 1973), p. 11.

d. Continuity of Reports

While there is no evidence to support the assumption that work reports are inadvertently mishandled or lost in the main, it is possible that these events could occur. Neither the present nor the experimental forms have provision for consecutively numbering reports, whereby missing report forms could be noted.

e. Exchange of Reports by Servicing Units

For many years aid servicing responsibilities have been assigned to primary and secondary units. Normally most servicing of a particular aid has been accomplished by the primary unit. Occasionally the responsible secondary unit has serviced the aid in order to correct a discrepancy while the primary unit was not in the area. This included the completion and appropriate distribution of the work report. The current SANDS system does not provide for copies of work reports to be retained by the secondary units. Recently the primary-secondary concept has been modified in that mobile Aids to Navigation Teams (ANTS) and buoy tenders have a dual responsibility for jointly assigned aids, as aid servicing functions not requiring the larger buoy tender are accomplished by the less expensive ANT. It is important that these units provide each other with copies of work reports for jointly assigned aids so each unit is kept fully advised of aid status.

f. Equipment Lost or Damaged During Servicing

The present work report contains no provisions for indicating equipment lost or damaged during servicing. Some servicing units have made local use of this information, which can be indicated in the remarks section. For example should a buoy be known to be sunk near its aid position and never located, knowledge of this information would be important to subsequent aid servicing in the same area. During extremely cold weather a power unit is given rough handling such that it is damaged. A lantern assembly fully equipped with other visual signal components is accidently lost over the side or damaged during servicing; while working a buoy moorings part and are lost. These and other instances occur frequently, but only after several months have elaspsed is their loss picked up in a survey report. Some of this information never enters the present SANDS System. By providing for the recording of such information on the work report, better and more timely estimates of actual aid hardware useage can be obtained.

g. Report Format

A distinct format advantage of the experimental form over the present form is the use of a plain language format by the reporting unit. This emphasizes the use of abbreviations and acronyms easily associated with the type of data they represent. This feature not only would eliminate common direct reading code errors, but also would permit

easier and more rapid completion of the report. Well designed check mark entries can save time and promote accuracy.

2. Selection of Additional Processing Method

The current SANDS data processing system uses Common Business-Oriented Language (COBOL). The primary output, Quarterly Report of Operation of Aids to Navigation (Program 03844C), provides a detailed source of periodic aid inventory information and servicing statistics. It was designed in view of the fact that the greatest cost in operating aids to navigation lies in personnel, vessels, and facilities rather than aid hardware. Through statistical analysis of the visits made to aids it was hoped that A-to-N operating costs could be reduced.

In order to supplement the current Quarterly Report of Operation, it was desired to find a simple method for statistical analyses and a way to monitor short range aids to navigation, in particular lighted buoys and their power units. According to recent Quarterly Reports of Operation, the vast majority of all discrepancy visits occur because of power or battery failures. The monitoring process would be primarily designed to detect inadvertent SANDS reporting errors at the field level and simple oversights at all levels. Thus enhancing aid reliability and decreasing the number of controllable discrepancy visits. Discussion of a new data processing method is timely because the Coast Guard is anticipating consolidation of its present EDP equipment with other DOT agencies within the next year.

The search for such a data processing method led to the selection of the Statistical Package for the Social Sciences (SPSS),[34] one of several statistical analysis packages in existence. SPSS is a system of prepackaged program (sub-programs) that can process raw data in a variety of tasks under any sequence of circumstances. It was especially designed to process survey questionnaires which are, in certain ways, similar to SANDS Reports. Input data can be read from disk, tape, or data cell files in addition to punched cards. Besides being flexible and inexpensive, SPSS is simple to use.

The SPSS system can accommodate up to 500 variables. Features include, one-way frequency distributions, with descriptive statistics and histograms, crosstabulation between two or more variables, correlation, multiple regression, scalogram, and factor analyses. SPSS has provisions for user written internal programs. Optional data modification routines allow one to select variables meeting specified circumstances, a feature especially well suited for SANDS searching procedures. It has provisions for taking a random sample from a file, so that if one is maintaining a file of considerable size, a smaller random sample can be taken

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[34] SPSS was developed by two social scientists, Norman Nie and Dale H. Bent, at Stanford University in 1965. Together with C. Hadlai Hull, they co-authored Statistical Package for the Social Sciences in 1970. The National Opinion Research Center at the University of Chicago currently maintains and distributes SPSS. The package can be purchased for under $1,000.00 by nonprofit organizations.

to produce statistically significant results at a reduced cost. Another feature involves a weighing process whereby estimated population parameters can be assigned to each case. Because SPSS enables value labels of up to 20 characters in length to be associated with each variable value, this processing method appears well designed to handle a plain language work report format should this form be implemented.

E. DATA ORGANIZATION

1972 and 1973 SANDS data of 100 lighted buoys located within the Thirteenth Coast Guard District were transferred to standard 80-column punch cards. Each visit to an aid was considered a case and contained data on description, status and service, and analysis cards. There were a total of 402 visits made to the 100 buoys. Routine visits without component replacement were consolidated with other data yielding a final file of 268 cases. Light List (LL) numbers of the aids examined were taken from the 1973 Light List, Volume III, Pacific Coast and Pacific Islands and compared with the work reports. Codes contained in the SANDS Manual and on the work reports were used where possible. Because additional questions were desired reflecting some of the changes mentioned for the work report, appropriate codes were assigned for these new variables. A listing of all codes with explanations is contained within the programs. Testing and rearranging of format and types of data were accomplished with two initial runs. Subsequent runs of the

100 buoys were deemed suitable for the selected studies. The computer program listings and related output have been appended.

In order to accurately analyze battery performance, last recharge data information prior to 1972 was obtained from the Thirteenth CG District. This was necessary because of the problems in determining RBDT's for primary batteries as discussed above. Complicating the situation was the fact that policy changes for RBDT safety and correction factors were implemented since 1972. Thus by using the present standard RBDT policies contained in COMDTINST 10500. 32A and indicating the previous known recharge data in 1970 or 1971, an accurate measure of power unit performance was accomplished. The only exception to this was that COMDTINST 10500.32A does not contain RBDT information for nonstandard characteristics and the few aids operating with nonstandard flashers were eliminated from this analysis.

F. APPLICATION OF A MODIFIED MANAGEMENT INFORMATION SYSTEM

The primary purpose of this discussion is to illustrate how utilization of an additional processing method similar to that already presented and a modified aids to navigation work report, including some of the suggested changes, can be effectively combined to improve the operation of the Short Range Aids to Navigation Subsystem. A secondary purpose is to illustrate the complexity of the procedures involved in determining RBDT.

On August 1, 1973, Commandant Instruction 10500.32A was promulgated in order to disseminate essential information relating to primary batteries for aids to navigation. A previous directive in this series was cancelled. Enclosure (2) of this instruction contains a service guide for primary batteries including tables of Rated Battery Discharge Times for approved power, lamp, and characteristic combinations. This directive is an official source from which units can obtain RBDT's for their lighted aids. The instruction was issued with six errors present in the Tables of Enclosure (2), four involving lamp life and two involving incorrect RBDT's. One of the RBDT errors (2000 ampere-hour battery capacity with .55 amp lamps and a QKFL 0.3 characteristic) was almost a year in error: 1 year and three days (1003) in lieu of 1 year and 358 day (1358). On August 5, 1974, Change One to the basic instruction transmitted changes correcting the original six errors.

When consideration is given to the many tables and sources of information contained in COMDTINST 10500.32A, it is easy to understand how such errors occurred. In order to demonstrate the complexity of an RBDT computation and verify that 1358 is the correct basic RBDT for the combination in question, a detailed description of the procedures and calculations involved has been presented in Appendix C. As a result of this computation it was verified that the basic RBDT for subject component is 723 days (1358 Julian days). Servicing units relying upon the RBDT Tables and replacing power units for a

2000 a-h power capacity, .55 amp lamps, and QKFL (0.3) characteristic combination between August 1973 and August 1974, would possibly use the wrong RBDT (1003) in calculating the replacement date. When change one was issued, it indicated to make pen and ink number corrections to the tables and thus it is possible that the real impact of the error was not even understood then because no written explanation was included.

In addition to determining appropriate RBDT's at the time of power unit replacement, servicing units will occasionally need to adjust the RBDT period. Interim adjustments are necessary when an aid's lamps or flasher are replaced with components of a different lamp size (load) or characteristic respectively.

There are two different approaches in compensating for the simple oversight errors involved in the situations previously described. These approaches are SANDS monitoring and SANDS searching. SANDS monitoring of lighted buoy power units could be accomplished if the present work report were modified to include at least the last power unit replacement date. Given this replacement date and determining the RBDT based upon the existing battery capacity, lamp, and characteristic combination, a correct scheduled power unit replacement date can be projected for each buoy monitored through use of SPSS data-transformation cards. Periodically by use of SPSS data-selection cards the scheduled power unit replacement date for each buoy as indicated on the SANDS

report can be compared with the related correct projected date. Depending upon the prespecified variance range desired, buoys not within the tolerance so specified would be identified. For example, a buoy is equipped with a 2000 a-h power capacity, .55 amp lamps, and a QKFL (0.3) characteristic. Upon being recharged and having a scheduled recharge date determined in error due to the error in COMDTINST 10500.32A, if prespecified monitoring limits were 90 days, this buoy would be readily identified because the error involved was 355 days. Once this buoy is identified and subsequently examined closely, it would be determined that an error existed and other buoys equipped with an identical power-lamp-characteristic combination might also be scheduled for power unit replacement in error. At this time SANDS searching procedures could then be utilized through SPSS data-selection cards to actually identify all buoys with the wrong scheduled replacement date. It is possible that all the process need entail would be to select the desired combination of circumstances using SPSS and then, in association with other processing methods, have letters automatically printed and addressed to the units in need of the particular information.

This application of SANDS monitoring could also be used periodically to identify all lighted aids with questionable scheduled recharge dates in order to prevent discrepancies. For that matter, SANDS monitoring could be set up to detect all types of potential errors or omissions as well. It

could also be used by administrative or procurement personnel to search out aids with special circumstances to effectively disseminate information about them.

The following illustration is a summary of potential application of SANDS monitoring and searching routines. A detailed explanation and analysis is contained in Appendix D.

Through a simulated SANDS monitoring routine using buoys located in the Thirteenth CG District, it was determined that an aid, Coos Bay Channel Lighted Buoy 18 (LL 1279) had a scheduled recharge date not falling within the limits specified. Through SANDS searching routines all aids with identical power, lamp, and characteristic combinations were located. Three such aids with potential errors were found but only Coos Bay CH LB 18 actually contained an RBDT error. This was 33.3% of the aids under examination. In effect, the error involved early replacement of a power unit and approximately $195 worth of unused battery capacity forgone.[35] If a modified SANDS Report for Coos Bay CH LB 18 had been monitored periodically, the error could have been discovered before the power unit was replaced. Similarly, once the error had been discovered through SANDS monitoring or other means, COMDT (GEOE) could have searched out all remaining

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[35] For this analysis presented in Appendix D, the 30-day cloud cover factor applying solely to the 13th District was not included in order to make a more reasonable extension of potential impact service-wide.

aids with the potential error using SPSS to prevent potential early recharging of other aids under identical circumstances.

According to SANDS data of January 1974, there were approximately 115 buoys in service equipped with 2000 a-h power capacity, .55 amp lamps, and QKFL (0.3) flasher characteristic combination. Assuming that 33.3% of all such buoys were erroneously recharged under similar circumstances, the amount of battery capacity wasted would be about $7,475.00. Even if only 10% of these buoys were recharged early, the expected waste of battery capacity alone would be over $2,200.00, or more than twice as much as the cost of the SPSS package itself.

There were also 616 light structures with the flasher characteristic-lamp combination of QKFL (0.3) and .55 amp respectively. Since some of these aids were powered by 3000 a-h battery combinations, no error was involved in them. However, since the error was not detected or corrected for over a year, it is likely that a significant number of the light structures equipped with 2000 a-h battery capacity were also recharged early. When considering that the $7,475 potential loss is related to just one instance of simple oversight at the administrative and field levels, the magnitude of all potential undetected errors for all battery powered lighted aids, taking into account special discrepancy correction or unnecessary visits, can be fully appreciated.

Besides being especially vulnerable to nonfunctioning, lighted buoys are being maintained by servicing units that have been increasingly burdened in getting the job done, due to rapid turnover of personnel and other unfavorable circumstances such as the sharply higher fuel costs. In addition the servicing frequency of aids has been recently extended. By modifying the management information system and SANDS Report so that lighted buoys could be monitored, not only field personnel but other personnel as well would stand to benefit from the new flow of information in carrying on their aids to navigation functions.

IV. EXAMINATION OF AIDS TO NAVIGATION RELIABILITY, HAZARD, AND FAILURE RELATIONSHIPS

A. PURPOSE

The purpose of this study is to demonstrate the usefulness of the SPSS processing method in examining the frequencies of various causes for Short Range Aids to Navigation malfunctions, and the potential for determining hazard, failure, or error prone combinations or circumstances of components.

B. AREAS OF EXAMINATION

Information to be examined during the study were divided into the following four general areas:

1. Routine inventory information and visit statistics. This provides a population data base for subsequent analysis.
2. Major causes for nonfunctioning and or replacement (relief) of each aid and selected aid components.
3. Significant trends among the following specific combinations of components and or circumstances indicating failure, hazard, or error propensities.
   a. Buoys relieved due to weather or collision as a function of aid location and time of the year.
   b. Buoys relieved due to various reasons as a function of percentage of expected total useful

operating life of power units consumed at the time of replacement or retirement.

c. Buoys relieved for other than routine reasons as a function of buoy size.

d. Power units replaced due to environmental hazards, personnel errors, or manufacturing errors as a function of aid location, buoy size, vent valves, light characteristic, power source, lampchanger, flasher, sound signal, daylight control, bottom description, bridle size, swivel size, first chain size, and Rated Battery Discharge Time (RBDT).

e. Percentage of power units lives realized at the time of replacement or retirement as a function of aid location, buoy size, vent valves, light characteristic, power source, lampchanger, flasher, sound signal, daylight control, bottom description, bridle size, swivel size, first chain size, RBDT, and power units replaced for various reasons.

f. Flashers replaced due to environmental hazards, personnel errors, or manufacturing errors as a function of buoy size, lantern, lampchanger, flasher, and sound signal.

g. Flashers replaced due to collision identified by Aid Light List (LL) Number.

h. Lampchangers replaced due to environmental hazards, personnel errors, or manufacturing errors as a function of lamp size (type) and sound signal.

i. Daylight controls replaced due to environmental hazards, personnel errors, or manufacturing errors as a function lantern color, lantern and sound signal.

j. Lanterns replaced due to environmental hazards, personnel errors, and manufacturing errors as a function of aid location, lantern, and sound signal.

k. Failure of lamps of various sizes of a particular aid as a function of aid location, buoy size, lamp size, lantern, and sound signal.

l. Replacement of entire moorings due to preventive maintenance (normal wear) or weather as a function of aid location and bottom description.

4. Special types of information or questions.

a. What is the actual percentage of expected total useful operating lives consumed by power units at the time of replacement or disposal due to lighted buoy withdrawals, discontinuances, or temporary relief by unlighted buoys?

b. Identification of buoys and moorings lost or damaged while on station or being serviced, due to being adrift, washed ashore, sunk, or reported as missing.

The region being examined is the Oregon Coast and the Columbia River. It is noted that the coastal environment which includes several bay, harbor, and inlet areas, is normally subjected to severe storm conditions throughout the winter season (Figure 8). The Columbia River, which separates the states of Oregon and Washington, is navigable for ocean-going vessels for about 100 miles. Because of its great importance to commerce, transportation, and recreation, the Columbia River is at times a place of very heavy marine traffic.

As a result of the facts described above, it would be expected that weather would have significant influence upon the maintenance of aids along the Oregon Coast. It would also be reasonable to expect that the severity of weather would contribute to a higher than servicewide average percentage of in-service failures due to manufacturing errors, since this environment represents some of the most adverse circumstances under which aid components are required to operate. Presumably collisions with passing vessels would be a factor in the operation of buoys along the Columbia River.

Considering this environment, it was felt that weather, power unit failure, and collisions would be the major causes of aid failure, in that order. For buoys it was believed that location and type of operation would determine the frequency of reliefs, times found or reported off station and subsequently lost, missing, or salvaged. Due to previous

U.S. Coast Guard Photograph with caption from Piloting, Seamanship, and Small Boat Handling, Chapman, p. 287.

Left: Tillamook Rock Lighthouse, standing a mile offshore at Tillamook Head, Oregon, is one of the most exposed stations on the Pacific Coast. The protecting glass of the light, 133 feet above sea level, has been smashed several times by stones driven by great storm waves. Landing at this station is often difficult, if not impossible

FIGURE 8

seasonal weather patterns, it was anticipated that lighted buoys operating on a permanent (remaining in service year round) basis at exposed locations, would be relieved for other than routine reasons primarily during the months of November through March. For the replacement or failure of components, it was expected that aid location would be the dominant factor since location would dictate whether the aid the components were installed upon was exposed, protected, and or subject to heavy marine traffic. In subsequent trial analyses this expectation was very strongly evidenced. Therefore, it was decided to examine component and operation data as a function of aid location in order to determine combinations significantly prone to problems. Despite the presence of environmental hazards (location), it was hypothesized that buoy size and the presence and type of sound signals would be a significant factor upon overall component performance, that RBDT intervals and related power capacities would have an impact upon percentage of power unit consumption realized, that vent valve configuration would be important to power unit performance, that sound signals would have a substantial, detrimental effect upon lamps, and that lantern color (red or green) and type (plastic or glass) would have an effect upon daylight control failures. It was expected that smaller lamp sizes would result in a greater relative percentage of lamp failures than larger sizes. Of all visual signal components, it was hypothesized that solid-state flashers would be replaced the fewest total

number of times (excepting projects), due to their strict design, lack of moving parts, watertightness, and projected long lives. It was believed that the CG-6P Lampchangers (six-place) would perform better than FU-1297 (four-place) Lampchangers, and that both types of lampchangers would be adversely affected by sound signals. It was also anticipated that appendages (moorings) would be rigorously tested along the coastal region, especially, chain of 1 7/8" size, which is the largest size that can be accommodated by the mechanical chain stopper. Finally, it was suspected that less than 50% of potential power unit lives were being consumed at the time of replacement or disposal, in view of all factors presented concerning this environment.

Two SPSS computer runs were conducted for this study. Both runs utilized a file containing data on 402 visits made to 100 buoys during calendar years 1972 and 1973. Routine visits without component replacement were consolidated with other data, yielding a final file of 268 cases. The first analysis provided visit and inventory data base statistics, and organized aid hardware replacement data for specific replacement reasons, namely routine servicing, improper installation, water damage, defective, collision, weather or vandalism etc. Due to the number of possible reasons for replacement and the limited amount of data examined, the reasons for replacement categories were consolidated into nine categories for a second analysis, the consolidated categories being: routine servicing, environmental hazards,

technical-administrative errors, personnel errors, failures caused by another component, convenient or conjunctive servicing, manufacturing errors, corrosion, and projects, directives, or experimental testing. Specific analyses were conducted in both studies. The programs and related outputs, which are contained in the Appendices, include comments with explanation of the procedures and coding utilized throughout the study, SANDS Manual and Work Report codes have been used where applicable.

C. SUMMARIZATION OF RESULTS

A summary tabulation of key data base statistics is provided in Table V. Tabulations of all data base statistics are contained in Computer Output (before recoding) pages 11 to 57. One aid was discontinued during 1973. Since there were a total of 402 visits during the two year study period, an average of about two visits per year were made to each aid. Of interest was the observation that three aids were visited 9 times and three other aids 8 times. All six of these aids were located along the Oregon Coast, with most of the visits being related to environmental damage. Of importance to ensuing analyses was the fact that 35% of all aid locations were classified as Exposed Sea Coast (Oregon Coast), and 30% as Protected River (Columbia River). Thus a combined total of 65 buoys were located in the areas expected to be most vulnerable to environmental or traffic hazards.

Summary of Key Data Base Statistics for 100 Lighted Buoys and their Components Located in the Thirteenth Coast Guard District as of December 31, 1973

Type of Component or Operation	Number and Percentage of Total Population	Percentage of Total Population at Locations Classified as Exposed Sea Coast	Percentage of Total Population at Locations Classified as Protected River
Operation:			
Permanent	91	77	100
Seasonal (no replacement)	4	100	0
Seasonal (with winter replacement)	4	100	0
Location:			
Exposed Sea Coast	35	100	0
Protected River	30	0	100
Buoy Size:			
10 x 39	5	14.3	0
9 x 38	9	20.0	0
9 x 32	10	20.0	3.3
8 x 26	35	45.7	30.0
7 x 17	11	0	20.0
7 x 15	13	0	23.3
6 x 20	9	0	20.0
Construction:			
Welded, standard pockets, large vents, radar reflector	72	-	-

*One buoy was discontinued during 1973.

TABLE V (Continued)

Vent Valves			
1 per pocket, balls installed	78	97.1	73.3
1 per pocket, no balls installed	18	0	26.7
Light Characteristic:			
Fl 4 (0.4)	73	60.0	83.3
QKFL (0.3)	13	8.6	16.7
Light Color:			
Green	17	17.6	16.7
Red	34	17.1	46.7
White	48	74.3	36.7
Lamp Size			
1.15 amp 12 volt	49	100	10.0
0.77 amp 12 volt	47	0	90.0
Lantern-Optic			
155 mm Acrylic Plastic	79	68.6	96.7
200 mm Pressed Glass	16	31.4	0
Power Unit Capacity and Type:			
60E2 (6000 a-h, two 30E2 Units)	12	25.7	6.7
30E2 (3000 a-h)	4	5.7	0
20S1 (2000 a-h, two 10S1 Units)	7	8.6	3.3
20E2 (2000 a-h, two 10E2 Units)	36	34.3	40.0
10S1 (1000 a-h)	4	2.9	6.7
10E2 (1000 a-h)	28	5.7	40.0

TABLE V (Continued)

Lampchanger:			
CG-6P (six-place)	36	42.9	40.0
FU-1297 (four-place)	62	54.3	60.0
Flasher:			
CG-181	72	80.0	60.0
C-R S-1065 SS	22	11.4	36.7
Sound Signal:			
None	56	11.4	90.0
Whistle, 4 Ball	22	51.4	3.3
Bell, 1962 Tapper Arrangement	7	11.4	6.7
Daylight Control:			
C - For use with Clear Lanterns (Glass and Plastic)	47	74.3	36.7
R - For Colored, Plastic Lanterns	39	17.1	56.7
B - For Colored, Glass Lanterns	11	8.6	3.3
Bottom Description:			
Sand	51	68.6	36.7
Mud	24	2.9	53.3
Rock	9	14.3	10.0
Bridle Size:			
1 1/4" x 15'	63	45.7	73.3

TABLE V (Continued)

Swivel Size:			
1 3/4" Second Class	66	51.4	76.7
2" First Class	23	48.6	3.3.
First Chain Size:			
1 1/4"	27	0	66.7
1 1/4"	36	25.7	30.0
1 5/8" and larger	35	74.3	3.3

It was noted from flasher data base statistics that 73 flashers were of the FL 4 (0.4) characteristic, 1 flasher of the FL 2.5 (0.5) characteristic, and none were of the FL 6 (1.0) characteristic. This finding was found to be indicative of lighted buoys and light structures service-wide during the same period:

> "In 1966 three simple, slow flash characteristic (flashing every 2.5,4, and 6 seconds) were designated for standard use in minor aids to navigation. This standardization was intended to provide the mariner with a uniform, easy to identify system while simplifying the selection of equipment to meet operational requirements. Equal use of these three characteristics would maximize the ability of mariners to differentiate between nearby aids. However, in the past six years the Flashing 4 second characteristic has become so common that it is now found on 87% of all simple, slow flashing aids.
>
> The popularity of the Flashing 4 second characteristic is due to its low 10% duty cycle. The Flashing 2.5 and 6 second characteristics have duty cycles of 20% and 16.7% respectively, with proportionately higher battery consumption. To encourage greater use of these latter characteristics their flash lengths have been shortened to produce more favorable duty cycles. The new FL 2.5 (0.3) and FL 6 (0.6) characteristics are economically competitive with the FL 4 (0.4) characteristic and should therefore see greater use without imposition of required use quotas."

In addition nine flashers were found to be nonstandard, and aids equipped with these flashers were not included in the power unit life analyses as standard RBDT intervals for such flashers are not available.

Table VI contains the major causes for aid and aid component malfunctions, as well as other significant reasons for component replacement. As expected, weather and collisions, dominated the primary causes for aid malfunctions,

TABLE VI

Summary of the Primary Causes for Aid and Aid Component Malfunctions And Other Significant Reasons for Replacement

Aid - Component	*Denotes Recoded Category Major Cause of Nonfunctioning		Other Reason Replaced	Total Number of Times Replaced
All aids	Weather	41 times	False alarm 8 times	
	Collisions	19 times	Third consecutive similar discrepancy 12 times	
	Power Unit Failure	13 times		
Buoys (relieved)	Weather	23 times		66
	Collisions	5 times		
	Corrosion	2 times		
Power Units (replaced)	Environmental Hazards*	37 times	Routine Servicing 41 times	124
	Weather	22 times		
	Collisions	7 times	Convenience-Followup 18 times	
	Personnel Errors*	15 times		
	Manufacturing Errors*	10 times (8.1%)		

TABLE VI (Continued)

Flashers (replaced)	Environmental hazards*	40 times		No indicated reason 17 times	94
	Weather	20 times			
	Collisions	12 times			
	Manufacturing Errors*	7 times	(7.5%)		
	Improper Installation	2 times			
Lampchangers (replaced)	Environmental hazards*	40 times		No indicated reason 17 times	91
	Weather	20 times			
	Collisions	12 times			
	Personnel Errors*	19 times			
	Manufacturing Errors*	7 times	(7.7%)		
Daylight Controls (replaced)	Environmental hazards*	36 times			85
	Manufacturing Errors*	6 times	(7.1%)		
Lanterns (replaced)	Environmental hazards*	40 times			87
	Manufacturing Errors*	1 time	(1.1%)		
Lamps (all failed) (replaced)	Manufacturing Errors*	7 times		(Burned out or Defective Only)	165
	Improper Installation	1 time			
Entire Moorings (replaced)	Weather	23 times			35

41 and 19 cases occurring respectively. Buoys were relieved due to weather 23 times, with 95.7% of these occurrences taking place at exposed sea coast locations. The percentage of power unit life expended at the time of relief in such locations was always less than 40%. In 12 instances, weather was the primary cause of failure for at least three consecutive discrepancy visits to the same buoy. When considering the time of year associated with the relief of buoys due to weather, a definite pattern was detected as follows:

10 reliefs during the period January to March 1972

1 relief during April 1972

1 relief during November 1972

8 reliefs during the period January to March 1973

2 reliefs during December 1973

It should be noted that some of the reliefs indicated for January, were actually the result of buoys being washed ashore during December. These occurrences subsequently led to the search, testing and evaluation of new mooring employment methods to reduce the loss of aid hardware and frequency of buoys off station.[36] Table VII reflects optional data

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[36]One of the methods was evaluated with four lighted buoys at coastal bar locations utilizing a shock sinker system. This concept provided for a shock sinker which would occasionally be lifted off the bottom due to buoy movement and a heavier submerged sinker weighing 9 tons. The mooring included 1 5/8" chain between the bridle and the shock sinker and one shot of 1 7/8" chain between the two sinkers. CCGDTHIRTEEN Operation Order 094/72 of 9 June 1972.

provided in SANDS Report remarks sections concerning such losses.

TABLE VII

Statistics Concerning Buoys Reported As Adrift, Washed Ashore, or Missing

Buoys either lost or not salvaged	7 times
Buoys located and or salvaged	13 times
Buoys never located	1 time
Moorings lost; includes above	24 times

After obtaining mixed results with special mooring appendages, the District changed the operation of several lighted buoy locations (two located in Yaquina Bay) which had experienced repeated problems in maintaining buoys on station, from permanent to seasonal. This procedure involves withdrawing the lighted buoy during part of the year. Sometimes the lighted buoy is replaced with an unlighted buoy. This system has become routine for the Great Lakes during the winter, when no or little marine traffic exists. As a result, significant savings of aid hardware were realized during the winter-spring season of 1974.

Eighty percent of the buoys relieved due to being involved in collisions with passing vessels were located on the Columbia River, 3 and 1 instances respectively. Also, 10 of the 12 flasher replacements resulting because of collisions took place along the Columbia River, but only

one buoy was involved in more than one incident, that one being involved twice. Thus no aids which should be considered collision prone were identified in this study.

An unexpected and surprizing observation was the fact that 17 flashers were replaced for no indicated reason of a total of 94 replaced during the two year period. This observation will be further discussed in Part B (AREAS OF FURTHER RESEARCH). The results shown in Table VI also indicate that lampchangers were replaced for no indicated reason the same number of times.

Examination of power units replaced due to personnel errors revealed that the light characteristic, QKFL (0.3), is associated with an unusually high number of such errors. While the FL 4 (0.4) characteristic was found on 73 aids and related to 60% of the personnel errors, the QKFL (0.3) type found on only 13 aids accounted for more than 33% of all power units replaced for this reason. It was also recalled from Chapter III Part F (APPLICATION OF A MODIFIED MANAGEMENT INFORMATION SYSTEM), that the QKFL (0.3) characteristic was involved in RBDT Table errors; possibly the consequences of this problem are stronger than originally anticipated. It is also likely that personnel are more familiar with the most common FL4 (0.4) type and its related RBDT intervals than the less frequently used QKFL (0.3) characteristic.

The study of power unit replacements afforded a good comparison of the magnitude of hazard associated with location. For example, 73% of the power units replaced due to environmental hazards were in service at exposed sea coast locations, more than twice the percentage of aids at these locations. Protected River sites accounted for only 16% of the replacements, while about half of the aids were at this class of location. This suggests the clear dominance of weather over collision as an environmental hazard. In looking at the impact of buoy size upon power unit replacement due to environmental hazards, buoy sizes 10 x 39 and 8 x 26 were compared. As shown in Table V, although 14.3% of buoys located along the exposed sea coast were 10 x 39 buoys, a much smaller percentage (2.7%) were associated with these events. 8 x 26 buoys accounted for 62.2% of such replacements although comprising only 45.7% of the buoys in exposed sea coast locations. Thus the larger size buoy appears to be better able to cope with its environment. No meaningful comparison of percentage of power unit life realized could be made with these two buoy sizes as 3 out of 5 of the 10 x 39 type were equipped with nonstandard flashers. Unexpectedly, lighted buoys with built in whistles of the 4 ball variety were involved with only 27% of the power units replaced due to environmental hazards despite comprising over 51% of the lighted buoys in exposed sea coast locations. It may be that its unique design built into the buoy tube provides a good platform upon which to

ride out rough seas, with less harm being done to components installed.

Surprisingly, all 10 power units replaced due to manufacturing errors were linked to the FU-1297 (four-place) lampchanger. This type of lampchanger was installed on 62 buoys but only 19 of those were at exposed sea coast locations. While the CG-6P (six-place) lampchanger is known to be of better design, no trend could be detected with lampchangers replaced for various reasons and the type of lampchanger. It may be that the FU-1297 has a special effect upon batteries, such as heavy drainage.

Overall power unit performance was better than the predicted 50% estimate, with the mean percentage of expected total useful operating life consumed at the time of replacement or retirement for 96 power units examined being 63.82%. A brief summary of the special procedures utilized in conducting this analysis is contained in Appendix E. The range for this datum was 3% to 121%, with one additional aid identified with the unusually high percentage of 164%. Upon further examination it seemed likely that an error involving last replacement date information or a SANDS oversight existed, although such a long life is not impossible.

While only 34% of all types of lanterns were colored red, this same color was attributed with 67% of the daylight controls replaced due to manufacturing errors. The fact that a lantern was fabricated with glass or plastic appeared to have little effect upon these daylight control malfunctions.

As was anticipated from previous servicewide evaluations, the larger size 1.15 amp lamps were more reliable than the smaller 0.77 amp lamps. The 1.15 amp lamp type comprised 49% of the lamp size population and was installed on all exposed sea coast buoys. Yet despite this exposure, 57.1% of all lamp failures (all lamps failed), were with 0.77 amp lamps. However, there was no clear relationship between lamp failures and the presence and type of sound signals.

D. AREAS FOR FURTHER RESEARCH

1. Reliability Model Building

As shown in Figure 9, a reliability block diagram for a typical lighted buoy, failure of any one component (except for a lamp, provided a good spare is available and the lampchanger is functioning), means the buoy has failed. While it is a matter of opinion whether failure of a daylight control, leading to 24 hour per day operation of the buoy's visual signal system, constitutes a failure, eventually the resulting extra battery drain will result in battery failure if not corrected. If all components are new, the component with the least minimum time to failure (again excepting lamps), will most likely be the cause of an aid nonfunctioning. A full analysis of reliability however, can be quite difficult because of the complex nature and interdependence of components.

2. Sensitivity Analysis of Flasher Inventory Procedures

It may be recalled from the summarization of results

Reliability Block Diagram for a Typical Lighted Buoy

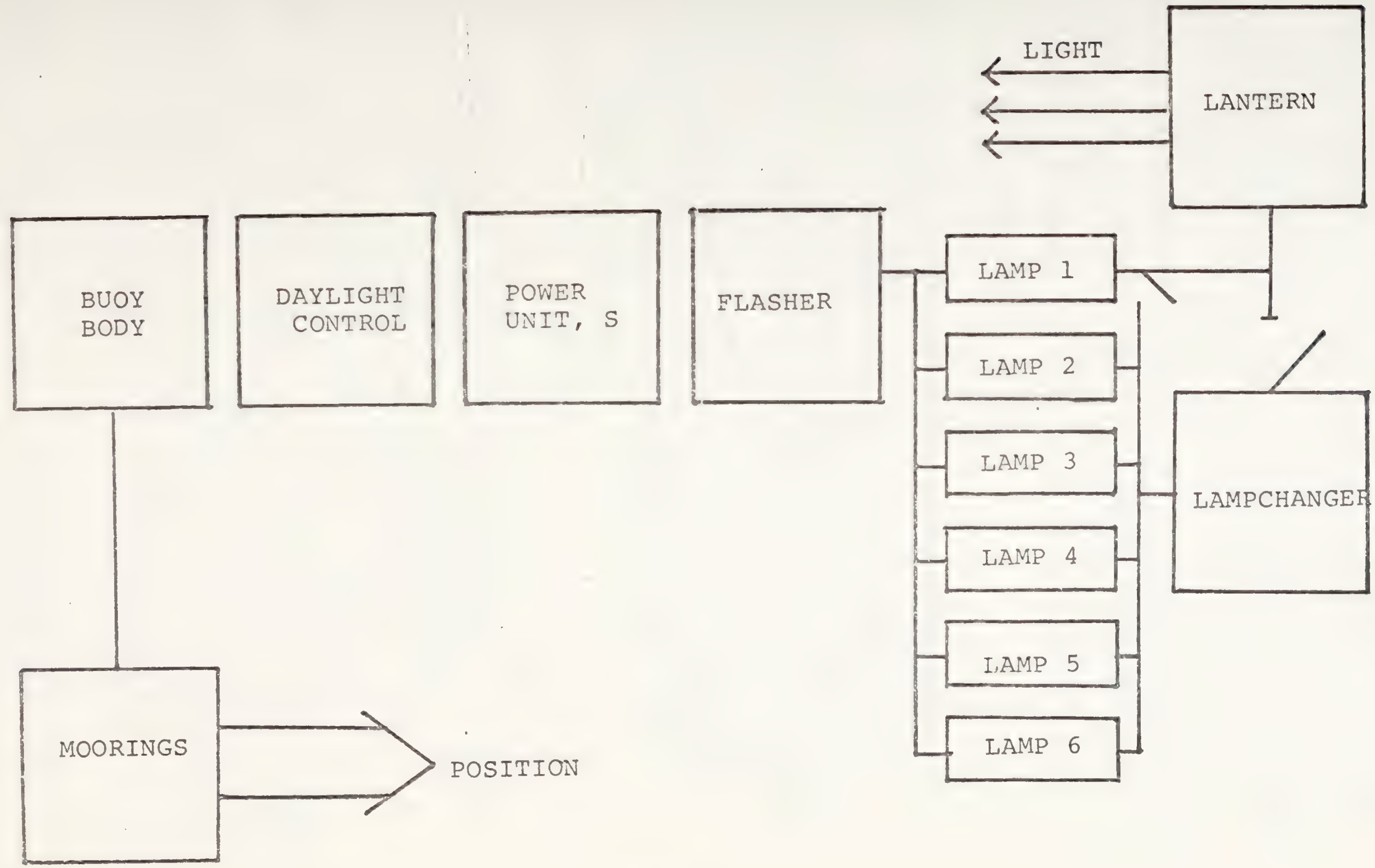

FIGURE 9

presented in Section 3, that a finding of special interest concerned the replacement of 17 flashers for no indicated reason. It was also noted that lampchangers were replaced for the same unknown reason the same number of times. Because these findings indicated a significant problem, this situation was further examined. A logical explanation for many of these instances appears to have been found:

Contributed by: Commandant (GEOE)

> "...The guarantee expiration date shown on the nameplate of certain aids-to-navigation equipment indicates that date after which the manufacturer is no longer required to repair or replace a defective unit at no cost - it is not an indication as to when the unit will no longer operate reliably. The design life of flashers, lampchangers and similar aids-to-navigation equipment is many times the guaranteed period. These equipments must be used until failure rates indicate that continued use is no longer justified. New equipments should be placed into service as soon as practicable so as to take full advantage of the manufacturer's repair or replacement guarantee."[37]

Contributed by: Aids to Navigation School

> "The original predicted half-life of the CG-181 was 13 years. This means that at the end of 13 years, 50% of the flashers would still be operating. It was based on the known reliability of the components used in the flasher. However, we now have an appreciable amount of operating data indicating that the half-life appears to be 20 years. There is no test that can be applied to a solid state flasher to determine when failure is about to occur. A large portion of failures that do occur during the half-life will be in the infancy of the flasher and replacement is covered by guarantee. Therefore, the long life expectancy of the majority of flashers that survive infancy reduces the need to place an arbitrary age limit on the flasher. Flashers recovered from damaged or destroyed aids should be replaced if they

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[37] Aids to Navigation Bulletin (December 1972 - April 1973), p. 11.

have lost their watertightness, or have been subjected to physical damage."[38]

The solid state flasher is designed as a long life, nonrepairable item emphasizing simplicity and maximum reliability. The circuitry of the CG-181 Flasher is contained in a factory sealed watertight metal case weighing under 2 1/2 pounds. Each flasher is constructed to withstand shock and vibrations incident to service on lighted buoys. The flasher has built-in electronic reversed polarity and short circuit protection features in addition to standard external electrical connections. The reversed polarity feature prevents damage that might otherwise be sustained when batteries occasionally reverse their polarity internally. The short circuit feature not only prevents damage but also will prevent a flasher from falsely functioning if all connections are not made. Thus the flasher is designed to preclude improper installation due to simple oversights. Each flasher is guaranteed against failure for two years from the last date of shipment of the last flasher procured under a particular contract. As specified, the failure rate of all flashers in service is not to exceed 5% per year. At this failure rate and after 10 years of operation for example, 59.8% of the flashers that were originally installed would still be in service.

In an attempt to further highlight the extent of stillborn and infancy failures of flashers, SANDS data from the

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[38] Aids to Navigation Bulletin (April-June 1970), p. 16.

Ninth, CG District for 18 lighted aids and 20 flashers were analyzed. For these aids, solid-state flashers were installed during 1967, 1968, or 1969. Their performance was observed each season through the 1973 winter withdrawals. The consolidated results shown in Table VIII were obtained from the above data. A detailed listing of the results is contained in Appendix F.

TABLE VIII

Summary of Solid State Flasher Performance for 18 Lighted Aids to Navigation in the Ninth Coast Guard District (1967-1973)

Flasher Status	Frequency	Range (years)	Average Time In Service
Remaining in service at the end of 1973 or functional but temporarily out of service due to buoy withdrawals.	13	4.29 - 6.63	5.36 years
Replaced due to failure	2	0.16 - 0.98	0.57 year
Replaced due to projects or other reasons not related to the flasher	5	1.58 - 5.89	3.87 years

While only 18 aids were examined due to time constraints, a brief review of other data for the same area and period indicated similar patterns. Results substantiated the contention that if a flasher is to fail, it most likely will do so within the two year warranty period. Otherwise the flasher will probably remain in service until unable to survive environmental hazards or personnel errors.

These results indicate that present flasher inventory policies may be suboptimal. A study in this area for the CG Supply Center was recently conducted.[39] It would appear that further research, such as flasher sensitivity analyses considering the overall Aids to Navigation Mission and related factors, is also warranted.

[39] Development of an Optimal Inventory System for Selected Aids to Navigation Components of the United States Coast Guard Supply System, R. Castler, J. Kissinger, and R. Pokress, George Washington University, O.R. 291. July 1974.

V. CONCLUSIONS AND RECOMMENDATIONS

A. MODIFICATION OF THE AIDS TO NAVIGATION MANAGEMENT INFORMATION SYSTEM

A need exists to modify the current Aids to Navigation Management Information System. Supporting this contention are findings made in 1970 by the management-consultant firm, Booz, Allen Applied Research, Inc., concerning the Short Range Aids to Navigation support and servicing systems. As a result of the Booz, Allen studies and subsequent Coast Guard evaluation, several Aids to Navigation Management Information System (SANDS System) modifications have been implemented, including the Quarterly Report of Operation of Aids to Navigation (Program 03844C). This report is designed for the purpose of extracting aid inventory and visit statistics data, and even though it has become an effective management tool, its usefulness is limited by the present SANDS Reporting System. The Aids to Navigation Work Report (CG-4429), which is the heart of the reporting system, has remained essentially unchanged since its inception in 1967. This is so despite the fact that many changes in aids to navigation policy, development, and hardware have occurred. In addition to being the primary source of raw data, the work report becomes a legal and historical record for each aid. Errors detected in any part of a report produced as evidence in a court, discredit the entire report and Coast Guard. Supporting the contention that the present

work report needs modification is the fact that an Aids to Navigation Work Report with major revisions is being currently tested on an experimental basis.

The findings presented in Table IV (Summaries of Major Types of SANDS Errors Detected in 79 Work Reports for the Thirteenth CG District 1972-1973) indicated an average of one error for each two work reports examined. Furthermore it was noted that inconsistent, incomplete, or missing information which were frequently encountered, hampered the interpretation of reports to the extent that questionable data had to be resolved with the Thirteenth District. It was determined that many of the errors detected could be attributed to either the content or format of the current SANDS Report. Based on the examination of the present and experimental work reports, several important provisions and changes require consideration for inclusion in future work report revisions.

1. Power Units and Batteries

The addition of space for information on last date of replacement or service, projected date of next service, and service interval to the SANDS reporting form is desirable, as then the service period could be easily determined from the report form. The mere addition of data concerning the last replacement date would enable verification of projected service dates through SANDS System monitoring by using existing report inventory information and known

related intervals. For power units or batteries there is only a scheduled recharge date. This information was adequate when the present form was first implemented because secondary batteries, predominantly in use then, were normally recharged every six months.

However this data is especially important for the primary batteries in use today, since their long and flexible service interval requires complicated computations and multiple table lookups in order to compute the projected replacement data. In addition, power units and battery failures are the primary cause of most aids to navigation discrepancies.

2. Exchange of Reports by Servicing Units

In view of the anticipated increased utilization of Aids to Navigation Teams (ANTS) in servicing aids on a dual basis with other units (tenders), the need for these operating units to provide each other with information of work performed to jointly assigned aids exists.

3. Work Report Format

A distinct format advantage of the experimental form over the present form is the use of a plain language format by the reporting unit. This emphasizes the use of abbreviations and acronyms easily associated with the type of data they represent. This feature not only would eliminate many common errors, but also would permit easier and more rapid completion of the report.

While the experimental version of the SANDS report allows for desired format changes and inclusion of last date, service interval, and projected date information on the unit copy, this latter feature must also be provided on the district copy. This is necessary so that such information is available for data processing, thus enabling SANDS monitoring and searching routines, which are especially desirable for lighted buoy power units, one of the most prevalent component problem areas.

A need exists to further exploit the potential information available in SANDS data. A particular need for feedback of useful information to field units exists. Two current information sources available to field units are the Annual Aids to Navigation Assignment List (CG-4500) and informal Aids to Navigation Bulletins. The Aids to Navigation Bulletins are an information source of immense value to all personnel involved with aids to navigation duties. It is suggested that a cumulative index for Aids to Navigation Bulletins be included with each addition. This would facilitate more effective utilization of this valuable source of communications by providing an easy way to rapidly identify all articles appearing in various bulletins that deal with a particular subject.

Because of recently extended servicing intervals, a special information system which would monitor SANDS data and feed back questionable information to servicing units

appears to be of much unrealized value. Thus, simple oversights could be detected and potential discrepancies or unnecessary waste of aid hardware could be avoided.

Based upon the illustration provided in Chapter III (APPLICATION OF A MODIFIED MANAGEMENT INFORMATION SYSTEM), it is believed that there is sufficient evidence in support of SANDS monitoring and searching procedures to warrant their inclusion into the SANDS System. Justification appears to stem in appreciation of the magnitude of all potential undetected errors involving battery powered lighted aids alone.

It is recommended that consideration be given to evaluating some sort of system to monitor routine data to identify exceptional circumstances. Modification and implementation could be undertaken by Headquarters on a temporary and experimental basis. This program would be designed for the approximate 3927 Lighted Buoys in service at the present time, the short range aids most vulnerable to malfunctions. Such a program would partially compensate for simple oversights, time constraints, high turnover rate of personnel and the recently extended aid servicing intervals. The conception of this limited program is very timely because the Coast Guard's electronic data processing facilities are to be consolidated and modified in the near future and feasible since the additional processing method presented (SPSS) is inexpensive and easily utilized in conjunction with other computer program languages.

B. STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES (SPSS)

The results set forth in Chapter IV, demonstrates the performance of the SPSS data processing method in examining the frequencies of various causes for Short Range Aids to Navigation (SRAN) malfunctions. SPSS demonstrated considerable potential for determining hazard, failure or error prone combinations or circumstances of components. The cost of this statistical package is approximately $1000.00 to non-profit organizations.

It is recommended that this package, or a similar one capable of SANDS searching and monitoring functions, be procured in association with Department of Transportation EDP facilities consolidation and modification.

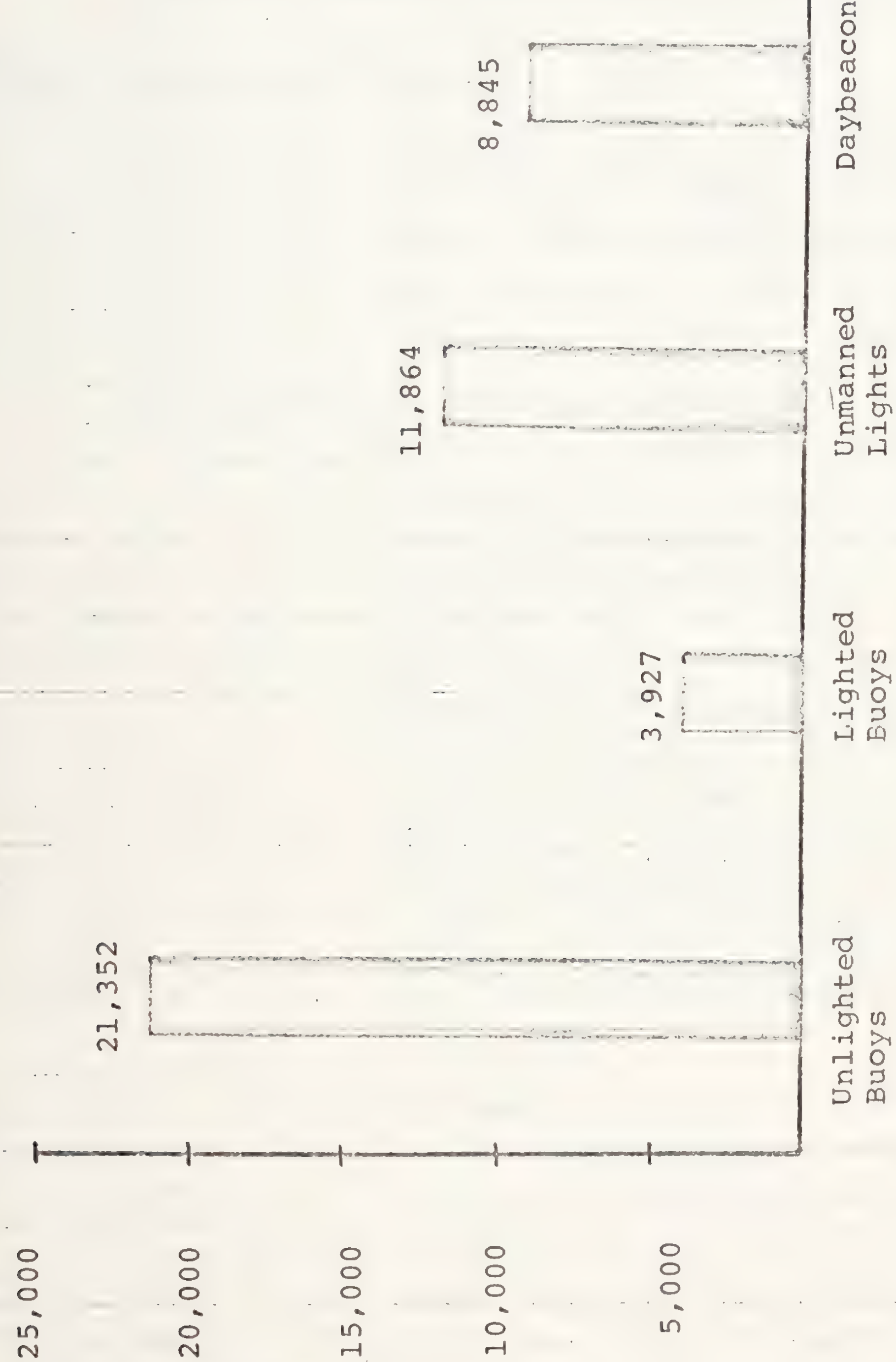
C. FUTURE RESEARCH

This project has been envisioned as a preliminary investigation into an area in which a good deal of further investigation is warranted. Many of the longer term goals in the overall research have been met only in a cursory fashion due to time constraints. Because of the complex nature and interdependency of aids to navigation and aid components, a thorough evaluation of all of the issues and questions presented would require extensive and detailed analysis. Therefore this project should be considered as a beginning rather than as an end.

In order to thoroughly evaluate the issues and question discussed in this preliminary research, it is suggested that

a team of personnel possessing expertise in information system design and statistical analysis be designated. Possible additional methods for such analysis could include reliability model building with provisions for component dependence, sensitivity analysis of flasher inventory policies, and decision tree modelling for buoy positioning procedures.

APPENDIX A: NUMBER OF VARIOUS SHORT RANGE AIDS IN SERVICE ON 31 DEC. 1973



Source: Quarterly Report of Operation of Aids to Navigation
31 December 1973

APPENDIX B: SUMMARY OF ERRORS IN 79 AIDS TO NAVIGATION WORK REPORTS FOR 25 LIGHTED BUOYS LOCATED IN THE THIRTEENTH COAST GUARD DISTRICT

Absolute Frequency	Part	Section	Comment
3	I	6	Daylight controls were found inoperative such that the buoy's visual signal system was operating day and night; battery scheduled recharge date remained unchanged.
1	I	General	A component indicated as replaced in the work performed section appeared as unchanged in the description section because the serial number remained the same.
3	I	18	While replacing colored glass lanterns with acrylic lanterns, the daylight control for colored glass lanterns was not indicated as changed. In these cases it was later determined that the daylight controls had been correctly changed but that the appropriate entries were omitted.
3	I	General	A component indicated as replaced in the work performed section appeared as unchanged in the description section because the new types were not compatible with with remaining components.
1	I	6	Schedules were not revised.
1	I	1	Content of aid name was in error.

1	I	6	Rated Battery Discharge Time (RBDT) used for lamp, flasher and battery capacity was more than 90 days in error as reflected in the recharge date.
1	I	General	Some entries in the Aid Description section on a hand-filled form were missing.
5	III	General	Entry of aid condition was missing.
1	V	General	Redundant entries such as checks for replaced entire moorings and replaced second chain on same report.
4	V	General	Component indicated as changed in the description section was not checked as replaced in the work performed section.
2	V	General	Checked wrong blocks as adjacent blocks were inadvertently checked.
2	VI	83	The wrong number code was used as a primary cause of failure as indicated by components replaced and remarks.
6	VI	83	Entry in the primary cause of failure block was missing although discrepancy was checked as the work reason.
1	VI	84	An entry was made in the date and time CG informed block although the discrepancy was discovered by the reporting unit.

1	VI	85	The hour worked was missing.
1	VI	85	The year digit of the Julian date work performed was missing.
2	VI	82	The number of defective or burned out lamps replaced was not indicated although replaced lamps entry in the work performed section was checked.
39	Total		

```
CODEBOOK RUN USING DATA PUNCHED ON CARDS FOR SANDS ERRORS                01/08/75        PAGE   14

***** GIVEN SPACE ALLOWS FOR   3 VARIABLES AND  1069 VALUES FOR CODEBOOK *****

                     *RECODE        VAR012 ('20E2','20S1','20JS','20S2','20U1','20E3'=2000)
                     COMMENT        THIS RECODE CARD PUTS ALL 2000 A-H POWER UNITS INTO ONE GROUP
                                    THE FOLLOWING CARD ENABLES THE RBDT FOR A COMBINATION TO BE
                                    SELECTED.  IN THIS MANNER EACH POTENTIAL DIFFERENT RBDT PERIOD
                                    IS DETERMINED.
                     *IF            (VAR007 EQ 103 AND VAR009 EQ 52 AND VAR012 EQ 2000) VAR069 = 1358
                     *IF            (VAR007 EQ 404 AND VAR009 EQ 54 AND VAR012 EQ 2000) VAR069 = 2152
                     COMMENT        VAR069 IS RBDT IN JULIAN DATE FORMAT - THE FOLLOWING CARDS CREATE
                                    NEW VARIABLE VARBDT WHICH IS RBDT CONVERTED INTO DAYS
                     *IF            (VAR069 GE 2000 AND VAR069 LE 1365) VARBDT = (VAR069 -1000) +365
                     COMMENT        THE FOLLOWING CARD CREATES NEW VARIABLE VARSER WHICH IS
                                    THE SCHEDULED NEXT RECHARGE DATE FROM THE SANDS WORK REPORT
                                    LESS THE JULIAN WORK DATE, OR THE ANTICIPATED LIFE OF THE
                                    BATTERY AS SEEN BY THE SERVICING UNIT.
                     *COMPUTE       VARSER=VAR068-VAR051
                     COMMENT        NEW VARIABLES VARUVR AND VARJDR REFLECT ERROR ADJUSTMENTS TO
                                    BE TOLERATED RESPECTIVELY .
                     *COMPUTE       VAROVR=VARBDT+90
                     *COMPUTE       VARUDR=VARBDT-90
                     COMMENT        THE FOLLOWING SELCTION CARD IDENTIFIES THOSE SCHEDULED NEXT
                                    RECHARGE DATES THAT DO NOT FALL WITHIN THE LIMITS SPECIFIED.
                     *SELECT IF     (VARSER GT VARUVR OR VARSER LT VARUDR)
                     COMMENT        THE FOLLOWING CRUSSTABULATIOIN CARD IDENTIFIES ALL AIDS BY
                                    LIGHT LIST NUMBER SELECTED AS BEING IN ERROR.

                     CROSSTABS      VAR068 BY VAR001

CODEBOOK RUN USING DATA PUNCHED ON CARDS FOR SANDS ERRORS                01/08/75        PAGE   15

FILE    SANDSRPT (CREATION DATE = 01/08/75)    AIDS TO NAVIGATION WORK REPORT ERRORS AND MONITORING

* * * * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F   * * * * * * * * * * * * * * * * * * *
   VAR068    SCHEDULED RECHARGE DATE                                BY  VAR001    LIGHT LIST NUMBER
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1

                    VAR001
           COUNT   I
          ROW PCT  ICCOS BY    ROW
          COL PCT  ICH LB 18   TOTAL
          TOT PCT  I 1279.00I
VAR068    ---------I--------I
           4192.   I      1 I        1
                   I 100.0  I    100.0
                   I 100.0  I
                   I 100.0  I
                  -I--------I
          COLUMN         1           1
           TOTAL     100.0       100.0

NUMBER OF MISSING OBSERVATIONS =       78
```

APPENDIX C: CALCULATION OF RATED BATTERY DISCHARGE TIME FOR A POWER UNIT, LAMP, AND FLASHER COMBINATION WITH 2000 A-H CAPACITY, .55 AMP LAMPS, AND A QKFL (0.3) CHARACTERISTIC

Sources:

(A) The duty cycle for a QKFL (0.3) characteristic is the ratio of the total time during which the flasher allows current to flow to the lamp during one period to the duration of one period, or 0.30 ampere-hour/day. This duty cycle requirement for a QKFL (0.3) flasher is contained in section 3.15.1 of the Flasher Specification (Purchase Description No. 181B), and must not differ from that specified by more than 5% at temperatures of 0° - 125°F.

(B) From Figure 14 in Visual Signallly, the average current in amperes during the time that the contacts are closed for a .55 amp lamp with a 0.3 second contact closure time is 0.639 ampere. This average current during a flasher period is corrected for the initial surge effect of low voltage (12 volt) lamps and a cold filament, when heavy current is drawn.

(C) It is current Coast Guard policy to base all daylight controlled RBDT computations on a standard 13-hour day or an average of 13 hours of darkness per day during a year.

(D) Flasher dissipation is the maximum allowable dissipation in ampere-hours, based upon 13 hours a day operation at 60°F as specified in Purchase Description 181B.

(E)* The winter correction factor ranges from 0 to 60 days: 0 days for service lives within cycles of 365-390 days, 721-750 days, etc,: 60 days in the 541-570 day cycle, etc.

* For aids at variance from standard conditions the following additional reductions in RBDT apply (the cloud cover factor for the Thirteenth District was used in the selected studies):

(1) Heavier than thin average daily cloud cover

Districts 1, 3, and 9	15 days per year
Districts 13 and 17	30 days per year

(2) Average nighttime temperature less than 30°F during the last 3 or more months of RBDT

15 days per year

(3) Average daytime temperatures over 80° for entire RBDT

30 days per year

(4) Daylight control shaded at sunrise or sunset

30 days per year

(5) Daylight control shaded at both sunrise and sunset

60 days per year

Equations: (The basic equations are contained in COMDTINST 10500.32A).

Daily current consumption = (B) Average lamp current x (A) Flasher duty cycle x (C) Hours of Operations + (D) Flasher dissipation

$$\text{Service Life} = \frac{\text{Battery capacity}}{\text{Daily current consumption}}$$

RBDT = Service life - (E) Winter correction factor + any applicable correction factors due to nonstandard conditions at aid location

Calculations:

(B)	Average lamp current		.639	ampere
(A)	Flasher duty cycle	x	.30	amp-hour/day
(C)	Hours of Darkness	x	13	hours/day
		=	2.492	ampere-hour/day
(D)	Flasher dissipation	+	.274	ampere-hour
	Daily current consumption	=	2.766	ampere-hour/day
	Battery capacity		2000	ampere-hour
	Daily current drain	÷	2.766	
	Service life	=	723	days
(E)	Winter correction factor	-	0	days
	Rated Battery Discharge Time	=	723	days or 1358 in Julian format

APPENDIX D: AN ILLUSTRATION OF SANDS MONITORING AND SEARCHING

From one of the initial runs made to determine SANDS reporting errors it was discovered that one RBDT error in COMDTINST 10500.32A (Primary Batteries for Aids to Navigation) existed among the aids examined. The aid in question was Coos Bay Channel Lighted Buoy 18 (LL 1279). This buoy had been recharged on 3221 (August 9, 1973) or after COMDTINST 10500.32A was in effect but before the change was issued. The RBDT period of 1003 was used to determine the new scheduled recharge date of 4192 (July 11, 1974), unknowingly in error.* At the time the error was discovered by the author, the Thirteenth CG District Aids to Navigation Office was contacted to relay information to the unit involved in the error, hopefully before this aid was recharged. As it turned out the buoy had already been recharged on 4189 (July 8, 1974), but the next scheduled recharge date was corrected.

Through simulated SANDS monitoring explained in the program (located at the end of this Appendix), it was determined that Coos Bay CH LB 18 had a scheduled recharge date not falling within the limits specified. The limits could have been 90 days or any period desired. In this example only the 2000 ampere-hour power unit, .55 amp lamp, and QKFL (0.3) characteristic combination RBDT of 1358 was used.

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*For the Thirteenth CG District, the cloud cover factor reduced the RBDT by 30 days.

Any other standard flasher lamp combination could be included in this process through the use of additional cards, one card per combination.

In order to search out remaining aids of this combination without using the scheduled recharge date condition, three SPSS data selection cards were used. Thus, all aids under these identical circumstances were located. By subdividing all aids contained in each Light List into a separate subfile for service-wide implementation, each Light List number of a subfile would be unique and pertain to only one aid.

Through SANDS searching routines it was discovered that three aids in the buoys examined were equipped with the specific power, lamp, and characteristic combination in question but only Coos Bay CH LB 18 (or 33.3%) actually contained an RBDT error. The cost of unused battery capacity for this aid was computed. The special 30-day cloud cover factor solely used in the Thirteenth District was not considered in order to make a more reasonable extension of potential inpact service-wide.

Value of 2000 Ampere-Hour Buoy Power Unit Capacity
Not Utilized with Coos Bay CH LB 18

(A) 2000 a-h power from Union Carbide is made up of two 1000 a-h (S10A) units. Fiscal Year 1975 cost of a 1000 a-h unit is $205.60.*

---

*Because of shipping cost variations, battery costs are slightly higher for West Coast and nonCONUS CG Districts.

(B) 2000 a-h power from McGraw Edison is made up of two 1000 a-h (ST-1010) units. Fiscal Year 1975 cost of a 1000 a-h unit is $191.23.*

(C) RBDT Actual 723 days (1358) - RBDT Used 368 days (1003) = 355 days.

(D) If all batteries were UCAR:

$2 \times 205.60 \times \frac{355}{723} = \$202$

If all batteries were Edison:

$2 \times 191.23 \times \frac{355}{723} = \$188$

Assuming 50% of the units were UCAR and 50% of the units were Edison $195 worth of unused battery capacity was forgone, for this aid alone.

(E) According to SANDS data of January, 1974, there were approximately 115 buoys in service with the 2000 ampere-hour battery power unit, .55 amp lamps, and QKFL (0.30) flasher characteristic combination.

(F) Assuming that 33.3% of the 115 buoys were recharged in error, the value of power unit capacities not utilized service-wide would have been as follows:

195 x 115 x .333 = $7475.

(G) Assuming that only 10% of these service-wide buoys were recharged early:

195 x 115 x .10 = $2242.

(H) Cost of SPSS is approximately $1000.00.

---

*Because of shipping cost variations, battery costs are slightly higher for West Coast and nonCONUS CG districts.

APPENDIX E: PROCEDURES UTILIZED IN COMPUTING FOR POWER UNITS, THE PERCENTAGE OF EXPECTED TOTAL USEFUL OPERATING LIFE CONSUMED AT THE TIME OF REPLACEMENT OR RETIREMENT

In order to determine the actual average percentage of expected total useful operating life realized at the time of power unit replacement, serveral special procedures were required. On page 3 of the run (After Breakdown Recording), is the internal program which was utilized to accomplish this objective. Comment explanations have been included. The first step involved converting RBDT's into a total number of days. For example, an RBDT of 2152 would be converted by subtracting 2000 and adding 730 or a total of 882 days. The second step involved consumption determination or Julian work date less the last recharge date (not indicated on the present work report and obtained from pre-test period SANDS data in some cases), and converting the difference into days. In the third step, certain reasons for the termination of a power unit's use were recoded so that they would be included in the evaluation. These reasons included seasonal withdrawals, discontinuance of an aid, and lighted buoys temporarily replaced by unlighted buoys. The fourth and last step, created a new variable, VARPER, percent of expected power unit life consumed. This new variable was rounded to the nearest whole percent through an automatic rounding capability feature of SPSS. All applicable flasher-lamp-battery combinations were examined except for aids equipped with non-standard flashers.

APPENDIX F: RESULTS FROM EXAMINATION OF 20 SOLID STATE FLASHERS FOR 18 LIGHTED AIDS TO NAVIGATION IN THE NINTH COAST GUARD DISTRICT (1967-1973)

Aid Light List Number	Flasher Type	Flasher Serial Number	Light Characteristic	Julian Date Org. Installed	Julian Date Replaced Withdrawn or End of Period	Duration Of Service in Years
Flashers remaining in service at the end of 1973 or installed upon Aids withdrawn during the 1973 Winter Season, and functioning normally at the time temporarily taken out of service:						
2148	CG-181	9613	FL 4(0.4)	68036	73357	5.88
2199	S-1065	3917	FL 6(1.0)	68065	73357	5.80
2413	VAPAIR	800055	Mo. A.4,2	69102	73351	4.68
2423	CG-181	111795	Mo. A.4,2	68265**	73351	5.24
2450	S-1065	4006	FL 4(0.4)	67110	73304	6.53
2458	VAPAIR	3893	FL 4(0.4)	67116	73346	6.63
2470	CG-181	11829	Mo. A.4,2	68283	73311	5.08
2481	VAPAIR	800056	Mo. A.4,2	69113	73346	4.64
2483	S-1065	3577	FL 4(0.4)	67198	73341	6.39
2498*	VAPAIR	800092	FL 2.5(.5)	69079	73271	4.53
2501	S-1065	4026	FL 4(0.4)	68203	73341	5.38
2502*	CG-181	15902	EI 6(3.0)	69260	73365	4.29
2504	CG-181	11975	FL 2.5(.5)	69100	73341	4.66
					AVERAGE TIME IN SERVICE	5.3638
Flashers replaced due to projects or other reasons not related to the flasher:						
2423	VAPAIR	800094	Mo. A.4,2	69111	70323	1.58
2424	S-1065	3655	FL 4.(0.4)	67143	73103	5.89
2477*	CG-181	12242	FL 6 (1.0)	69224	73200	3.93
2485*	VAPAIR	800090	FL 6 (1.0)	68256	72281	4.07
2503	VAPAIR	80111	FL 6 (1.0)	68184	72149	3.90
					AVERAGE TIME IN SERVICE	3.8740
Flashers replaced due to failure.						
2477*	CG-181	28790	FL 6 (0.6)	73200	73260	0.16
2485*	CG-181	23346	FL 6 (1.0)	72281	73275	0.98
					AVERAGE TIME IN SERVICE	0.5700

* Denotes Light Structure. No mark indicates Lighted Buoy
** Flasher was used on a different Aid for the 1969 Season

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FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR030 TOTAL NUMBER OF VISITS TO EACH AID,72-73

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
1 VISIT	1.	1	0.4	1.0	1.0
2 VISITS	2.	21	7.8	21.0	22.0
3 VISITS	3.	23	8.6	23.0	45.0
4 VISITS	4.	25	9.3	25.0	70.0
5 VISITS	5.	10	3.7	10.0	80.0
6 VISITS	6.	9	3.4	9.0	89.0
7 VISITS	7.	5	1.9	5.0	94.0
8 VISITS	8.	3	1.1	3.0	97.0
9 VISITS	9.	3	1.1	3.0	100.0
	0.	168	62.7	MISSING	100.0
	TOTAL	268	100.0	100.0	100.0

```
CCUEBOOK,MARGINALS,CROSSTABULATICNS BEFORE BREAKDOWN RECODING                         01/14/75        PAGE   12
FILE   ATCNAV13 (CREATICN CATE = 01/14/75)   100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST
VARIABLE   VAR030     TOTAL NUMBER OF VISITS TO EACH AID,72-73
      CODE
              I
         1.   ** (        1)   0.4 PCT
              I     1 VISIT
              I
              I
         2.   ************ (     21)   7.8 PCT
              I     2 VISITS
              I
              I
         3.   ************* (     23)   8.6 PCT
              I     3 VISITS
              I
              I
         4.   ************** (     25)   9.3 PCT
              I     4 VISITS
              I
              I
         5.   ****** (     10)   3.7 PCT
              I     5 VISITS
              I
              I
         6.   ****** (      9)   3.4 PCT
              I     6 VISITS
              I
              I
         7.   **** (      5)   1.9 PCT
              I     7 VISITS
              I
              I
         8.   *** (      3)   1.1 PCT
              I     8 VISITS
              I
              I
         9.   *** (      3)   1.1 PCT
              I     9 VISITS
              I
              I
         0.   ************************************************************************************ (    168)  62.7 PCT
   (MISSING)  I
              I
              I.........I.........I.........I.........I.........I.........I.........I.........I.........I.........I
              0        20        40        60        80       100       120       140       160       180       200
              FREQUENCY
```

CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING 01/14/75 PAGE 13

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

STATISTICS..

MEAN	4.020	STD ERROR	0.183	MEDIAN	3.700
MODE	4.000	STD DEV	1.826	VARIANCE	3.333
KURTOSIS	0.304	SKEWNESS	0.911	RANGE	8.000
MINIMUM	1.000	MAXIMUM	9.000		

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 168

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FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR002 OPERATION

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
AID DISCONTINUED	O	1	1.0	1.0	1.0
PERMANENT AID	P	91	91.0	91.0	92.0
SEASONAL-NC REPCT	S	4	4.0	4.0	96.0
WINTER REPLACEMENT	W	4	4.0	4.0	100.0
	TOTAL	100	100.0	100.0	100.0

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR003 LOCATION

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
AID DISCONTINUED		1	1.0	1.0	1.0
EXPOSED SEA COAST	B	35	35.0	35.0	36.0
EXPOSED BAY,HARBOR	C	1	1.0	1.0	37.0
EXPOSED RIVER	D	5	5.0	5.0	42.0
SEMI-EXPD BAY,HARBOR	L	4	4.0	4.0	46.0
SEMI-EXPD RIVER	M	12	12.0	12.0	58.0
BAY,HARBOR PROTECTED	T	12	12.0	12.0	70.0
PROTECTED RIVER	U	30	30.0	30.0	100.0
	TOTAL	100	100.0	100.0	100.0

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 0

CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING
FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST 01/14/75 PAGE 17
VARIABLE VAR006 VENT VALVES PER POCKET

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	0.	1	1.0	1.0	1.0
1,BALL INSTALLED	1.	78	78.0	78.0	79.0
2,BALLS INSTLD	2.	1	1.0	1.0	80.0
1 VENT ,NO BALLS	3.	18	18.0	18.0	98.0
2 VENTS,NO BALLS	4.	1	1.0	1.0	99.0
OTHER	5.	1	1.0	1.0	100.0
	TOTAL	100	100.0	100.0	100.0

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 0

CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING
FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST 01/14/75 PAGE 18
VARIABLE VAR008 LIGHT COLOR

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
		1	1.0	1.0	1.0
GREEN	G	17	17.0	17.0	18.0
RED	R	34	34.0	34.0	52.0
WHITE	W	48	48.0	48.0	100.0
	TOTAL	100	100.0	100.0	100.0

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 0

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FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR009 LAMP TYPE

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	0.	1	1.0	1.0	1.0
0.55 AMP 12VOLT	52.	3	3.0	3.0	4.0
0.77 AMP 12VOLT	53.	47	47.0	47.0	51.0
1.15 AMP 12VOLT	54.	49	49.0	49.0	100.0
	TOTAL	100	100.0	100.0	100.0

VALID CBSERVATIONS - 100
MISSING CBSERVATIONS - 0

CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING 01/14/75 PAGE 20

FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR010 LANTERN-OPTIC

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	0.	1	1.0	1.0	1.0
155 MM ACRYLIC	16.	79	79.0	79.0	80.0
200 MM P.GLASS	20.	16	16.0	16.0	96.0
200 MM ALLOTHER	23.	4	4.0	4.0	100.0
	TOTAL	100	100.0	100.0	100.0

VALID CBSERVATIONS - 100
MISSING CBSERVATIONS - 0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR012 POWER SOURCE-BATTERY

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
		1	1.0	1.0	1.0
1000 A-H,EDISON#2	10E2	28	28.0	28.0	29.0
1000 A-H,EDISON STA	10S1	4	4.0	4.0	33.0
1000 A-H,EDISON ST	10S2	1	1.0	1.0	34.0
2000 A-H,2EDISON#2	20E2	36	36.0	36.0	70.0
2000 A-H,2 EDSN STA	20S1	7	7.0	7.0	77.0
2000 A-H,2UN CARBIDE	20U1	1	1.0	1.0	78.0
2500 A-H,EDISON-OLD	25BY	3	3.0	3.0	81.0
3000 A-H,EDISON#2	30E2	4	4.0	4.0	85.0
5000A-H,EDISON-OLD	50BY	1	1.0	1.0	86.0
6000 A-H,2EDSN#2	60E2	12	12.0	12.0	98.0
6000 A-H,2 EDSN STA	60S1	2	2.0	2.0	100.0
	TOTAL	100	100.0	100.0	100.0

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 0

CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING 01/14/75 PAGE 22

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR014 LAMPCHANGER

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	0.	1	1.0	1.0	1.0
6 LAMP,CG6P CROC	65.	36	36.0	36.0	37.0
6LAMP,CG6PVAPAR	66.	1	1.0	1.0	38.0
4 LAMP,FU-1297	97.	62	62.0	62.0	100.0
	TOTAL	100	100.0	100.0	100.0

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 0

CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING 01/14/75 PAGE 23

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR015 FLASHER

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	0.	1	1.0	1.0	1.0
C-R S-1065 SS	65.	22	22.0	22.0	23.0
CG-181 C-R DEV.	81.	72	72.0	72.0	95.0
VAPAIR	83.	5	5.0	5.0	100.0
	TOTAL	100	100.0	100.0	100.0

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR016 SOUND SIGNAL

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
NO SOUND SIGNAL	0.	56	56.0	56.0	56.0
ELECTRIC HORN850-02	40.	1	1.0	1.0	57.0
WHISTLE 2 BALL	78.	1	1.0	1.0	58.0
WHISTLE 4 BALL	79.	22	22.0	22.0	80.0
BELL PRE 1952 TPR	81.	5	5.0	5.0	85.0
BELL1952 TAPPER	82.	5	5.0	5.0	90.0
BELL1962 TAPPER	83.	7	7.0	7.0	97.0
GONG1962 TAPPER	86.	3	3.0	3.0	100.0
	TOTAL	100	100.0	100.0	100.0

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR017 DAYLIGHT CONTROL

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	0.	1	1.0	1.0	1.0
CR-S1065-LS1	11.	2	2.0	2.0	3.0
C-CLEAR-ALL	31.	47	47.0	47.0	50.0
R-COLOR PLASTIC	32.	39	39.0	39.0	89.0
B-COLOR GLASS	33.	11	11.0	11.0	100.0
	TOTAL	100	100.0	100.0	100.0

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 0

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FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR018 BOTTOM DESCRIPTION

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
		1	1.0	1.0	1.0
GRAVEL	G	15	15.0	15.0	16.0
MUD	M	24	24.0	24.0	40.0
ROCK	R	9	9.0	9.0	49.0
SAND	S	51	51.0	51.0	100.0
	TOTAL	100	100.0	100.0	100.0

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 0

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FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR021 BRIDLE SIZE

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	0.	1	1.0	1.0	1.0
1" X12'	2.	9	9.0	9.0	10.0
1" X 15'	3.	2	2.0	2.0	12.0
1 1-4" X 15'	4.	63	63.0	63.0	75.0
1 1-2" X 18'	6.	11	11.0	11.0	86.0
1 1-2" X 26'	7.	14	14.0	14.0	100.0
	TOTAL	100	100.0	100.0	100.0

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 0

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FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR022 SWIVEL SIZE AND NUMBER

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	0.	1	1.0	1.0	1.0
1 1-2" 3RD CLASS	2.	10	10.0	10.0	11.0
1 3-4" 2ND CLASS	3.	66	66.0	66.0	77.0
2" 1ST CLASS	4.	23	23.0	23.0	100.0
	TOTAL	100	100.0	100.0	100.0

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 0

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FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR023 FIRST CHAIN SIZE

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	0.	1	1.0	1.0	1.0
1"	4.	1	1.0	1.0	2.0
1 1-4"	6.	27	27.0	27.0	29.0
1 1-2"	7.	36	36.0	36.0	65.0
1 5-8"AND LARGER	8.	35	35.0	35.0	100.0
	TOTAL	100	100.0	100.0	100.0

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR002 OPERATION BY VAR003 LOCATION
* PAGE 1 OF 1

VAR002	COUNT / ROW PCT / COL PCT / TOT PCT	VAR003: PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPCSED BAY,HARB C	EXPOSED SEA CUAS B	AID DISCONTINUED	ROW TOTAL
W WINTER REPLACEME		0	0	0	0	0	0	4	0	4
		0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	4.0
		0.0	0.0	0.0	0.0	0.0	0.0	11.4	0.0	
		0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	
S SEASCNAL-NO REPC		0	0	0	0	0	0	4	0	4
		0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	4.0
		0.0	0.0	0.0	0.0	0.0	0.0	11.4	0.0	
		0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	
P PERMANENT AID		30	12	12	4	5	1	27	0	91
		33.0	13.2	13.2	4.4	5.5	1.1	29.7	0.0	91.0
		100.0	100.0	100.0	100.0	100.0	100.0	77.1	0.0	
		30.0	12.0	12.0	4.0	5.0	1.0	27.0	0.0	
O AID DISCONTINUED		0	0	0	0	0	0	0	1	1
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	1.0
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	
COLUMN TOTAL		30	12	12	4	5	1	35	1	100
		30.0	12.0	12.0	4.0	5.0	1.0	35.0	1.0	100.0

FILE ATGNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR004 BUOY SIZE BY VAR003 LOCATION
* PAGE 1 OF 2

VAR004	VAR003 → COUNT / ROW PCT / COL PCT / TOT PCT	PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
AID DISCONTINUED	0. COUNT	0	0	0	0	0	0	0	1	1
	ROW PCT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	1.0
	COL PCT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
	TOT PCT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	
10 X 39	39. COUNT	0	0	0	0	0	0	5	0	5
	ROW PCT	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	5.0
	COL PCT	0.0	0.0	0.0	0.0	0.0	0.0	14.3	0.0	
	TOT PCT	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	
5 X 10	510. COUNT	0	1	0	0	0	0	0	0	1
	ROW PCT	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
	COL PCT	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	
	TOT PCT	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	
6 X 20	620. COUNT	6	1	2	0	0	0	0	0	9
	ROW PCT	66.7	11.1	22.2	0.0	0.0	0.0	0.0	0.0	9.0
	COL PCT	20.0	8.3	16.7	0.0	0.0	0.0	0.0	0.0	
	TOT PCT	6.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0	
7 X 15	715. COUNT	7	5	0	1	0	0	0	0	13
	ROW PCT	53.8	38.5	0.0	7.7	0.0	0.0	0.0	0.0	13.0
	COL PCT	23.3	41.7	0.0	25.0	0.0	0.0	0.0	0.0	
	TOT PCT	7.0	5.0	0.0	1.0	0.0	0.0	0.0	0.0	
7 X 17	717. COUNT	6	4	0	1	0	0	0	0	11
	ROW PCT	54.5	36.4	0.0	9.1	0.0	0.0	0.0	0.0	11.0
	COL PCT	20.0	33.3	0.0	25.0	0.0	0.0	0.0	0.0	
	TOT PCT	6.0	4.0	0.0	1.0	0.0	0.0	0.0	0.0	
8 X 20	820. COUNT	0	0	0	1	0	0	0	0	1
	ROW PCT	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	1.0
	COL PCT	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	
	TOT PCT	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	
	COLUMN TOTAL	30	12	12	4	5	1	35	1	100
		30.0	12.0	12.0	4.0	5.0	1.0	35.0	1.0	100.0

(CONTINUED)

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR004 BUOY SIZE BY VAR003 LOCATION
* PAGE 2 OF 2

VAR004	VAR003 COUNT ROW PCT COL PCT TOT PCT	PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
8 X 23	823.	1 25.0 3.3 1.0	0 0.0 0.0 0.0	1 25.0 8.3 1.0	1 25.0 25.0 1.0	0 0.0 0.0 0.0	1 25.0 100.0 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	4 4.0
8 X 26	826.	9 25.7 30.0 9.0	0 0.0 0.0 0.0	9 25.7 75.0 9.0	0 0.0 0.0 0.0	1 2.9 20.0 1.0	0 0.0 0.0 0.0	16 45.7 45.7 16.0	0 0.0 0.0 0.0	35 35.0
9 X 32	932.	1 10.0 3.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 20.0 40.0 2.0	0 0.0 0.0 0.0	7 70.0 20.0 7.0	0 0.0 0.0 0.0	10 10.0
9 X 34	934.	0 0.0 0.0 0.0	1 100.0 8.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
9 X 38	938.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 22.2 40.0 2.0	0 0.0 0.0 0.0	7 77.8 20.0 7.0	0 0.0 0.0 0.0	9 9.0
	COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR006 VENT VALVES PER POCKET BY VAR003 LOCATION
* PAGE 1 OF 1

VAR006	COUNT ROW PCT COL PCT TOT PCT	VAR003 PROTECTE D RIVER U	BAY,HARB OR PROTE T	SEMI-EXP D RIVER M	SEMI-EXP D BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISC ONTINUED	ROW TOTAL
	0.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 100.0 1.0	1 1.0
1,BALL INSTALLED	1.	22 28.2 73.3 22.0	9 11.5 75.0 9.0	4 5.1 33.3 4.0	4 5.1 100.0 4.0	4 5.1 80.0 4.0	1 1.3 100.0 1.0	34 43.6 97.1 34.0	0 0.0 0.0 0.0	78 78.0
2,BALLS INSTLD	2.	0 0.0 0.0 0.0	1 100.0 8.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
1 VENT ,NO BALLS	3.	8 44.4 26.7 8.0	1 5.6 8.3 1.0	8 44.4 66.7 8.0	0 0.0 0.0 0.0	1 5.6 20.0 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	18 18.0
2 VENTS,NO BALLS	4.	0 0.0 0.0 0.0	1 100.0 8.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
OTHER	5.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 2.9 1.0	0 0.0 0.0 0.0	1 1.0
	COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

C R O S S T A B U L A T I O N O F VAR007 LIGHT CHARACTERISTIC BY VAR003 LOCATION

VAR007 (COUNT / ROW PCT / COL PCT / TOT PCT) \ VAR003	PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
0.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 100.0 1.0	1 1.0
103. CK FL 0.3	5 38.5 16.7 5.0	2 15.4 16.7 2.0	2 15.4 16.7 2.0	0 0.0 0.0 0.0	1 7.7 20.0 1.0	0 0.0 0.0 0.0	3 23.1 8.6 3.0	0 0.0 0.0 0.0	13 13.0
122. QK FL * ALLOTHER	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 25.0 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
145. MO A.4FL.6EC,2.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 100.0 5.7 2.0	0 0.0 0.0 0.0	2 2.0
146. MO A*ALL OTHERS	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	6 100.0 17.1 6.0	0 0.0 0.0 0.0	6 6.0
251. FL 2.5 .05*	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 100.0 5.7 2.0	0 0.0 0.0 0.0	2 2.0
255. FL 2.5 .5**	0 0.0 0.0 0.0	1 100.0 8.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

(CONTINUED)

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

C R O S S T A B U L A T I O N O F
VAR007 LIGHT CHARACTERISTIC BY VAR003 LOCATION

VAR007	VAR003 COUNT / ROW PCT / COL PCT / TOT PCT	PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
FL 4 .4	404.	25 34.2 83.3 25.0	9 12.3 75.0 9.0	10 13.7 83.3 10.0	3 4.1 75.0 3.0	4 5.5 80.0 4.0	1 1.4 100.0 1.0	21 28.8 60.0 21.0	0 0.0 0.0 0.0	73 73.0
E INT 6 3.0	630.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 2.9 1.0	0 0.0 0.0 0.0	1 1.0
	COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * C R O S S T A B U L A T I O N O F * * * * *
VAR008 LIGHT COLOR BY VAR003 LOCATION
* * * * * PAGE 1 OF 1

VAR008	COUNT ROW PCT COL PCT TOT PCT	VAR003 PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPCSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
WHITE W		11 22.9 36.7 11.0	1 2.1 8.3 1.0	6 12.5 50.0 6.0	2 4.2 50.0 2.0	1 2.1 20.0 1.0	1 2.1 100.0 1.0	26 54.2 74.3 26.0	0 0.0 0.0 0.0	48 48.0
RED R		14 41.2 46.7 14.0	7 20.6 58.3 7.0	3 8.8 25.0 3.0	2 5.9 50.0 2.0	2 5.9 40.0 2.0	0 0.0 0.0 0.0	6 17.6 17.1 6.0	0 0.0 0.0 0.0	34 34.0
GREEN G		5 29.4 16.7 5.0	4 23.5 33.3 4.0	3 17.6 25.0 3.0	0 0.0 0.0 0.0	2 11.8 40.0 2.0	0 0.0 0.0 0.0	3 17.6 8.6 3.0	0 0.0 0.0 0.0	17 17.0
		0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 100.0 1.0	1 1.0
	COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * *
VAR009 LAMP TYPE BY VAR003 LOCATION
* * * * * * * * * * * * * * * * * * PAGE 1 OF 1

VAR009 (COUNT / ROW PCT / COL PCT / TOT PCT)	VAR003: PROTECTED RIVER U	BAY,HARBOR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
0.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 100.0 1.0	1 1.0
52. 0.55 AMP 12VOLT	0 0.0 0.0 0.0	2 66.7 16.7 2.0	0 0.0 0.0 0.0	1 33.3 25.0 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	3 3.0
53. 0.77 AMP 12VOLT	27 57.4 90.0 27.0	4 8.5 33.3 4.0	12 25.5 100.0 12.0	2 4.3 50.0 2.0	2 4.3 40.0 2.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	47 47.0
54. 1.15 AMP 12VOLT	3 6.1 10.0 3.0	6 12.2 50.0 6.0	0 0.0 0.0 0.0	1 2.0 25.0 1.0	3 6.1 60.0 3.0	1 2.0 100.0 1.0	35 71.4 100.0 35.0	0 0.0 0.0 0.0	49 49.0
COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR010 LANTERN-OPTIC BY VAR003 LOCATION
* PAGE 1 OF 1

VAR010	VAR003 COUNT ROW PCT COL PCT TOT PCT	PROTECTE D RIVER U	BAY,HARB OR PROTE T	SEMI-EXP D RIVER M	SEMI-EXP D BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISC ONTINUED	ROW TOTAL
	0.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 100.0 1.0	1 1.0
155 MM ACRYLIC	16.	29 36.7 96.7 29.0	8 10.1 66.7 8.0	11 13.9 91.7 11.0	3 3.8 75.0 3.0	3 3.8 60.0 3.0	1 1.3 100.0 1.0	24 30.4 68.6 24.0	0 0.0 0.0 0.0	79 79.0
200 MM P.GLASS	20.	0 0.0 0.0 0.0	1 6.3 8.3 1.0	1 6.3 8.3 1.0	1 6.3 25.0 1.0	2 12.5 40.0 2.0	0 0.0 0.0 0.0	11 68.8 31.4 11.0	0 0.0 0.0 0.0	16 16.0
200 MM ALLOTHER	23.	1 25.0 3.3 1.0	3 75.0 25.0 3.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	4 4.0
	COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *

VAR012 POWER SOURCE-BATTERY BY VAR003 LOCATION

* PAGE 1 OF 2

VAR012 \ VAR003 COUNT ROW PCT COL PCT TOT PCT	PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
60S1 6000 A-H,2 EDSN	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 100.0 5.7 2.0	0 0.0 0.0 0.0	2 2.0
60E2 6000 A-H,2EDSN#2	2 16.7 6.7 2.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 8.3 20.0 1.0	0 0.0 0.0 0.0	9 75.0 25.7 9.0	0 0.0 0.0 0.0	12 12.0
50BY 5000A-H,EDISON-O	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 2.9 1.0	0 0.0 0.0 0.0	1 1.0
30E2 3000 A-H,EDISON#	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 25.0 8.3 1.0	0 0.0 0.0 0.0	1 25.0 20.0 1.0	0 0.0 0.0 0.0	2 50.0 5.7 2.0	0 0.0 0.0 0.0	4 4.0
25BY 2500 A-H,EDISON-	0 0.0 0.0 0.0	1 33.3 8.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 66.7 5.7 2.0	0 0.0 0.0 0.0	3 3.0
20U1 2000 A-H,2UN CAR	1 100.0 3.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
20S1 2000 A-H,2 EDSN	1 14.3 3.3 1.0	2 28.6 16.7 2.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 14.3 100.0 1.0	3 42.9 8.6 3.0	0 0.0 0.0 0.0	7 7.0
COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

(CONTINUED)

FILE ATGNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* C R O S S T A B U L A T I O N O F *
VAR012 POWER SOURCE-BATTERY BY VAR003 LOCATION
* PAGE 2 OF 2

VAR012	COUNT ROW PCT COL PCT TOT PCT	VAR003 PROTECTE D RIVER U	BAY,HARB OR PROTE T	SEMI-EXP D RIVER M	SEMI-EXP D BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISC ONTINUED	ROW TOTAL
2000	20E2 A-H,2EDISUN	12 33.3 40.0 12.0	5 13.9 41.7 5.0	2 5.6 16.7 2.0	3 8.3 75.0 3.0	2 5.6 40.0 2.0	0 0.0 0.0 0.0	12 33.3 34.3 12.0	0 0.0 0.0 0.0	36 36.0
1000	10S2 A-H,EDISON	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 2.9 1.0	0 0.0 0.0 0.0	1 1.0
1000	10S1 A-H,EDISUN	2 50.0 6.7 2.0	1 25.0 8.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 25.0 2.9 1.0	0 0.0 0.0 0.0	4 4.0
1000	10E2 A-H,EDISON#	12 42.9 40.0 12.0	3 10.7 25.0 3.0	9 32.1 75.0 9.0	1 3.6 25.0 1.0	1 3.6 20.0 1.0	0 0.0 0.0 0.0	2 7.1 5.7 2.0	0 0.0 0.0 0.0	28 28.0
		0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 100.0 1.0	1 1.0
	COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR014 LAMPCHANGER BY VAR003 LOCATION
* PAGE 1 OF 1

VAR014	VAR003 COUNT ROW PCT COL PCT TOT PCT	PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
	0.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 100.0 1.0	1 1.0
6 LAMP,CG6P CRDC	65.	12 33.3 40.0 12.0	3 8.3 25.0 3.0	4 11.1 33.3 4.0	1 2.8 25.0 1.0	1 2.8 20.0 1.0	0 0.0 0.0 0.0	15 41.7 42.9 15.0	0 0.0 0.0 0.0	36 36.0
6LAMP,CG6PVAPAR	66.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 2.9 1.0	0 0.0 0.0 0.0	1 1.0
4 LAMP,FU-1297	97.	18 29.0 60.0 18.0	9 14.5 75.0 9.0	8 12.9 66.7 8.0	3 4.8 75.0 3.0	4 6.5 80.0 4.0	1 1.6 100.0 1.0	19 30.6 54.3 19.0	0 0.0 0.0 0.0	62 62.0
	COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR015 FLASHER BY VAR003 LOCATION
* PAGE 1 OF 1

VAR015 (COUNT / ROW PCT / COL PCT / TOT PCT)	VAR003: PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
0.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 100.0 1.0	1 1.0
65. C-R S-1065 SS	11 50.0 36.7 11.0	3 13.6 25.0 3.0	3 13.6 25.0 3.0	1 4.5 25.0 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	4 18.2 11.4 4.0	0 0.0 0.0 0.0	22 22.0
81. CG-181 C-R DEV.	18 25.0 60.0 18.0	8 11.1 66.7 8.0	9 12.5 75.0 9.0	3 4.2 75.0 3.0	5 6.9 100.0 5.0	1 1.4 100.0 1.0	28 38.9 80.0 28.0	0 0.0 0.0 0.0	72 72.0
83. VAPAIR	1 20.0 3.3 1.0	1 20.0 8.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	3 60.0 8.6 3.0	0 0.0 0.0 0.0	5 5.0
COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR016 SOUND SIGNAL BY VAR003 LOCATION
* PAGE 1 OF 2

VAR016 \ VAR003 COUNT ROW PCT COL PCT TOT PCT	PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
0. NO SOUND SIGNAL	27 48.2 90.0 27.0	12 21.4 100.0 12.0	8 14.3 66.7 8.0	3 5.4 75.0 3.0	1 1.8 20.0 1.0	0 0.0 0.0 0.0	4 7.1 11.4 4.0	1 1.8 100.0 1.0	56 56.0
40. ELECTRIC HORN850	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 20.0 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
78. WHISTLE 2 BALL	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 2.9 1.0	0 0.0 0.0 0.0	1 1.0
79. WHISTLE 4 BALL	1 4.5 3.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 4.5 25.0 1.0	2 9.1 40.0 2.0	0 0.0 0.0 0.0	18 81.8 51.4 18.0	0 0.0 0.0 0.0	22 22.0
81. BELL PRE 1952 TP	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 20.0 20.0 1.0	0 0.0 0.0 0.0	4 80.0 11.4 4.0	0 0.0 0.0 0.0	5 5.0
82. BELL1952 TAPPER	0 0.0 0.0 0.0	0 0.0 0.0 0.0	3 60.0 25.0 3.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 20.0 100.0 1.0	1 20.0 2.9 1.0	0 0.0 0.0 0.0	5 5.0
83. BELL1962 TAPPER	2 28.6 6.7 2.0	0 0.0 0.0 0.0	1 14.3 8.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	4 57.1 11.4 4.0	0 0.0 0.0 0.0	7 7.0
COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

(CONTINUED)

FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

C R O S S T A B U L A T I O N O F VAR016 SOUND SIGNAL BY VAR003 LOCATION

VAR016	COUNT / ROW PCT / COL PCT / TOT PCT	VAR003: PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
GONG1962 TAPPER	86.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	3 100.0 8.6 3.0	0 0.0 0.0 0.0	3 3.0
	COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * C R O S S T A B U L A T I O N O F * * *
VAR017 DAYLIGHT CONTROL BY VAR003 LOCATION

VAR017 (COUNT / ROW PCT / COL PCT / TOT PCT)	VAR003: PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPCSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
0.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 100.0 1.0	1 1.0
CR-S1065-LS1 11.	1 50.0 3.3 1.0	1 50.0 8.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 2.0
C-CLEAR-ALL 31.	11 23.4 36.7 11.0	1 2.1 8.3 1.0	5 10.6 41.7 5.0	2 4.3 50.0 2.0	1 2.1 20.0 1.0	1 2.1 100.0 1.0	26 55.3 74.3 26.0	0 0.0 0.0 0.0	47 47.0
R-COLOR PLASTIC 32.	17 43.6 56.7 17.0	5 12.8 41.7 5.0	7 17.9 58.3 7.0	1 2.6 25.0 1.0	3 7.7 60.0 3.0	0 0.0 0.0 0.0	6 15.4 17.1 6.0	0 0.0 0.0 0.0	39 39.0
B-COLOR GLASS 33.	1 9.1 3.3 1.0	5 45.5 41.7 5.0	0 0.0 0.0 0.0	1 9.1 25.0 1.0	1 9.1 20.0 1.0	0 0.0 0.0 0.0	3 27.3 8.6 3.0	0 0.0 0.0 0.0	11 11.0
COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * * *
VAR018 BOTTOM DESCRIPTION BY VAR003 LOCATION
* PAGE 1 OF 1

VAR018	VAR003 COUNT ROW PCT COL PCT TOT PCT	PROTECTED RIVER U	BAY,HARBOR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
S SAND		11 21.6 36.7 11.0	0 0.0 0.0 0.0	9 17.6 75.0 9.0	2 3.9 50.0 2.0	5 9.8 100.0 5.0	0 0.0 0.0 0.0	24 47.1 68.6 24.0	0 0.0 0.0 0.0	51 51.0
R ROCK		3 33.3 10.0 3.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 11.1 25.0 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	5 55.6 14.3 5.0	0 0.0 0.0 0.0	9 9.0
M MUD		16 66.7 53.3 16.0	5 20.8 41.7 5.0	2 8.3 16.7 2.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 4.2 2.9 1.0	0 0.0 0.0 0.0	24 24.0
G GRAVEL		0 0.0 0.0 0.0	7 46.7 58.3 7.0	1 6.7 8.3 1.0	1 6.7 25.0 1.0	0 0.0 0.0 0.0	1 6.7 100.0 1.0	5 33.3 14.3 5.0	0 0.0 0.0 0.0	15 15.0
		0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 100.0 1.0	1 1.0
	COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * C R O S S T A B U L A T I O N O F * * * * *
VAR021 BRIDLE SIZE BY VAR003 LOCATION
* * * * * PAGE 1 OF 1

VAR021	VAR003 → COUNT ROW PCT COL PCT TOT PCT	PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPCSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
	0.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 100.0 1.0	1 1.0
1" X12'	2.	6 66.7 20.0 6.0	2 22.2 16.7 2.0	1 11.1 8.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	9 9.0
1" X 15'	3.	1 50.0 3.3 1.0	1 50.0 8.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 2.0
1 1-4" X 15'	4.	22 34.9 73.3 22.0	8 12.7 66.7 8.0	11 17.5 91.7 11.0	4 6.3 100.0 4.0	1 1.6 20.0 1.0	1 1.6 100.0 1.0	16 25.4 45.7 16.0	0 0.0 0.0 0.0	63 63.0
1 1-2" X 18'	6.	1 9.1 3.3 1.0	1 9.1 8.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 18.2 40.0 2.0	0 0.0 0.0 0.0	7 63.6 20.0 7.0	0 0.0 0.0 0.0	11 11.0
1 1-2" X 26'	7.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 14.3 40.0 2.0	0 0.0 0.0 0.0	12 85.7 34.3 12.0	0 0.0 0.0 0.0	14 14.0
	COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR022 SWIVEL SIZE AND NUMBER BY VAR003 LOCATION
* PAGE 1 OF 1

VAR022	COUNT / ROW PCT / COL PCT / TOT PCT	PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
0.	COUNT	0	0	0	0	0	0	0	1	1
	ROW PCT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	1.0
	COL PCT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
	TOT PCT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	
2. 1 1-2" 3RD CLASS	COUNT	6	3	1	0	0	0	0	0	10
	ROW PCT	60.0	30.0	10.0	0.0	0.0	0.0	0.0	0.0	10.0
	COL PCT	20.0	25.0	8.3	0.0	0.0	0.0	0.0	0.0	
	TOT PCT	6.0	3.0	1.0	0.0	0.0	0.0	0.0	0.0	
3. 1 3-4" 2ND CLASS	COUNT	23	8	11	4	1	1	18	0	66
	ROW PCT	34.8	12.1	16.7	6.1	1.5	1.5	27.3	0.0	66.0
	COL PCT	76.7	66.7	91.7	100.0	20.0	100.0	51.4	0.0	
	TOT PCT	23.0	8.0	11.0	4.0	1.0	1.0	18.0	0.0	
4. 2" 1ST CLASS	COUNT	1	1	0	0	4	0	17	0	23
	ROW PCT	4.3	4.3	0.0	0.0	17.4	0.0	73.9	0.0	23.0
	COL PCT	3.3	8.3	0.0	0.0	80.0	0.0	48.6	0.0	
	TOT PCT	1.0	1.0	0.0	0.0	4.0	0.0	17.0	0.0	
COLUMN TOTAL		30	12	12	4	5	1	35	1	100
		30.0	12.0	12.0	4.0	5.0	1.0	35.0	1.0	100.0

FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * * *
VAR023 FIRST CHAIN SIZE BY VAR003 LOCATION
* PAGE 1 OF 1

VAR023	VAR003 → COUNT / ROW PCT / COL PCT / TOT PCT	PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPOSED SEA COAS B	AID DISCONTINUED	ROW TOTAL
	0.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 100.0 1.0	1 1.0
1"	4.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 8.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
1 1-4"	6.	20 74.1 66.7 20.0	5 18.5 41.7 5.0	1 3.7 8.3 1.0	1 3.7 25.0 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	27 27.0
1 1-2"	7.	9 25.0 30.0 9.0	5 13.9 41.7 5.0	10 27.8 83.3 10.0	2 5.6 50.0 2.0	1 2.8 20.0 1.0	0 0.0 0.0 0.0	9 25.0 25.7 9.0	0 0.0 0.0 0.0	36 36.0
1 5-8"AND LARGER	8.	1 2.9 3.3 1.0	2 5.7 16.7 2.0	0 0.0 0.0 0.0	1 2.9 25.0 1.0	4 11.4 80.0 4.0	1 2.9 100.0 1.0	26 74.3 74.3 26.0	0 0.0 0.0 0.0	35 35.0
	COLUMN TOTAL	30 30.0	12 12.0	12 12.0	4 4.0	5 5.0	1 1.0	35 35.0	1 1.0	100 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR004 BUOY SIZE BY VAR006 VENT VALVES PER POCKET
* PAGE 1 OF 2

VAR004	COUNT / ROW PCT / COL PCT / TOT PCT	VAR006 0.	1,BALL INSTALLED 1.	2,BALLS INSTLD 2.	1 VENT, NO BALLS 3.	2 VENTS, NO BALLS 4.	OTHER 5.	ROW TOTAL
AID DISCONTINUED	0.	1	0	0	0	0	0	1
		100.0	0.0	0.0	0.0	0.0	0.0	1.0
		100.0	0.0	0.0	0.0	0.0	0.0	
		1.0	0.0	0.0	0.0	0.0	0.0	
10 X 39	39.	0	4	0	0	0	1	5
		0.0	80.0	0.0	0.0	0.0	20.0	5.0
		0.0	5.1	0.0	0.0	0.0	100.0	
		0.0	4.0	0.0	0.0	0.0	1.0	
5 X 10	510.	0	0	1	0	0	0	1
		0.0	0.0	100.0	0.0	0.0	0.0	1.0
		0.0	0.0	100.0	0.0	0.0	0.0	
		0.0	0.0	1.0	0.0	0.0	0.0	
6 X 20	620.	0	7	0	2	0	0	9
		0.0	77.8	0.0	22.2	0.0	0.0	9.0
		0.0	9.0	0.0	11.1	0.0	0.0	
		0.0	7.0	0.0	2.0	0.0	0.0	
7 X 15	715.	0	12	0	0	1	0	13
		0.0	92.3	0.0	0.0	7.7	0.0	13.0
		0.0	15.4	0.0	0.0	100.0	0.0	
		0.0	12.0	0.0	0.0	1.0	0.0	
7 X 17	717.	0	9	0	2	0	0	11
		0.0	81.8	0.0	18.2	0.0	0.0	11.0
		0.0	11.5	0.0	11.1	0.0	0.0	
		0.0	9.0	0.0	2.0	0.0	0.0	
8 X 20	820.	0	1	0	0	0	0	1
		0.0	100.0	0.0	0.0	0.0	0.0	1.0
		0.0	1.3	0.0	0.0	0.0	0.0	
		0.0	1.0	0.0	0.0	0.0	0.0	
	COLUMN TOTAL	1	78	1	18	1	1	100
		1.0	78.0	1.0	18.0	1.0	1.0	100.0

(CONTINUED)

FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * *
VAR004 BUOY SIZE BY VAR006 VENT VALVES PER POCKET
* PAGE 2 OF 2

VAR004	VAR006 → COUNT / ROW PCT / COL PCT / TOT PCT	0.	1,BALL INSTALLED 1.	2,BALLS INSTLD 2.	1 VENT, NO BALLS 3.	2 VENTS, NO BALLS 4.	OTHER 5.	ROW TOTAL
8 X 23	823.	0	2	0	2	0	0	4
		0.0	50.0	0.0	50.0	0.0	0.0	4.0
		0.0	2.5	0.0	11.1	0.0	0.0	
		0.0	2.0	0.0	2.0	0.0	0.0	
8 X 26	826.	0	23	0	12	0	0	35
		0.0	65.7	0.0	34.3	0.0	0.0	35.0
		0.0	29.5	0.0	66.7	0.0	0.0	
		0.0	23.0	0.0	12.0	0.0	0.0	
9 X 32	932.	0	10	0	0	0	0	10
		0.0	100.0	0.0	0.0	0.0	0.0	10.0
		0.0	12.8	0.0	0.0	0.0	0.0	
		0.0	10.0	0.0	0.0	0.0	0.0	
9 X 34	934.	0	1	0	0	0	0	1
		0.0	100.0	0.0	0.0	0.0	0.0	1.0
		0.0	1.3	0.0	0.0	0.0	0.0	
		0.0	1.0	0.0	0.0	0.0	0.0	
9 X 38	938.	0	9	0	0	0	0	9
		0.0	100.0	0.0	0.0	0.0	0.0	9.0
		0.0	11.5	0.0	0.0	0.0	0.0	
		0.0	9.0	0.0	0.0	0.0	0.0	
	COLUMN TOTAL	1	78	1	18	1	1	100
		1.0	78.0	1.0	18.0	1.0	1.0	100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR004 BUOY SIZE BY VAR007 LIGHT CHARACTERISTIC
* PAGE 1 OF 2

VAR004	VAR007 COUNT ROW PCT COL PCT TOT PCT	0.	QK FL 0.3 103.	QK FL * ALLOTHER 122.	MO A.4FL .6EC,2.0 145.	MO A*ALL OTHERS 146.	FL 2.5 .05* 251.	FL 2.5 .5** 255.	FL 4 .4 404.	E INT 6 3.0 630.	ROW TOTAL
AID DISCONTINUED	0.	1 100.0 100.0 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
10 X 39	39.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 20.0 50.0 1.0	3 60.0 50.0 3.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 20.0 1.4 1.0	0 0.0 0.0 0.0	5 5.0
5 X 10	510.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 1.4 1.0	0 0.0 0.0 0.0	1 1.0
6 X 20	620.	0 0.0 0.0 0.0	2 22.2 15.4 2.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	7 77.8 9.6 7.0	0 0.0 0.0 0.0	9 9.0
7 X 15	715.	0 0.0 0.0 0.0	3 23.1 23.1 3.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 7.7 100.0 1.0	9 69.2 12.3 9.0	0 0.0 0.0 0.0	13 13.0
7 X 17	717.	0 0.0 0.0 0.0	1 9.1 7.7 1.0	1 9.1 100.0 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	9 81.8 12.3 9.0	0 0.0 0.0 0.0	11 11.0
8 X 20	820.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 1.4 1.0	0 0.0 0.0 0.0	1 1.0
	COLUMN TOTAL	1 1.0	13 13.0	1 1.0	2 2.0	6 6.0	2 2.0	1 1.0	73 73.0	1 1.0	100 100.0

(CONTINUED)

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

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VAR004 BUOY SIZE BY VAR007 LIGHT CHARACTERISTIC
* PAGE 2 OF 2

VAR004	VAR007 COUNT ROW PCT COL PCT TOT PCT	0.	QK FL 0.3 103.	QK FL * ALLOTHER 122.	MO A.4FL .6EC,2.0 145.	MO A*ALL OTHERS 146.	FL 2.5 .05* 251.	FL 2.5 .5** 255.	FL 4 .4 404.	E INT 6 3.0 630.	ROW TOTAL
8 X 23	823.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	4 100.0 5.5 4.0	0 0.0 0.0 0.0	4 4.0
8 X 26	826.	0 0.0 0.0 0.0	3 8.6 23.1 3.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 5.7 100.0 2.0	0 0.0 0.0 0.0	29 82.9 39.7 29.0	1 2.9 100.0 1.0	35 35.0
9 X 32	932.	0 0.0 0.0 0.0	2 20.0 15.4 2.0	0 0.0 0.0 0.0	1 10.0 50.0 1.0	1 10.0 16.7 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	6 60.0 8.2 6.0	0 0.0 0.0 0.0	10 10.0
9 X 34	934.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 1.4 1.0	0 0.0 0.0 0.0	1 1.0
9 X 38	938.	0 0.0 0.0 0.0	2 22.2 15.4 2.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 22.2 33.3 2.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	5 55.6 6.8 5.0	0 0.0 0.0 0.0	9 9.0
	COLUMN TOTAL	1 1.0	13 13.0	1 1.0	2 2.0	6 6.0	2 2.0	1 1.0	73 73.0	1 1.0	100 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * C R O S S T A B U L A T I O N O F * * * * *
VAR004 BUOY SIZE BY VAR016 SOUND SIGNAL
* * * * * PAGE 1 OF 2

VAR004	COUNT / ROW PCT / COL PCT / TOT PCT	VAR016: NO SOUND SIGNAL 0.	ELECTRIC HORN850 40.	WHISTLE 2 BALL 78.	WHISTLE 4 BALL 79.	BELL PRE 1952 TP 81.	BELL1952 TAPPER 82.	BELL1962 TAPPER 83.	GONG1962 TAPPER 86.	ROW TOTAL
AID DISCONTINUED	0.	1 100.0 1.8 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
10 X 39	39.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	5 100.0 22.7 5.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	5 5.0
5 X 10	510.	1 100.0 1.8 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
6 X 20	620.	8 88.9 14.3 8.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 11.1 20.0 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	9 9.0
7 X 15	715.	13 100.0 23.2 13.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	13 13.0
7 X 17	717.	11 100.0 19.6 11.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	11 11.0
8 X 20	820.	1 100.0 1.8 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
	COLUMN TOTAL	56 56.0	1 1.0	1 1.0	22 22.0	5 5.0	5 5.0	7 7.0	3 3.0	100 100.0

(CONTINUED)

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR004 BUOY SIZE BY VAR016 SOUND SIGNAL
* PAGE 2 OF 2

VAR004	VAR016 / COUNT / ROW PCT / COL PCT / TOT PCT	NO SOUND SIGNAL 0.	ELECTRIC HORN850 40.	WHISTLE 2 BALL 78.	WHISTLE 4 BALL 79.	BELL PRE 1952 TP 81.	BELL1952 TAPPER 82.	BELL1962 TAPPER 83.	GONG1962 TAPPER 86.	ROW TOTAL
8 X 23	823.	2	0	0	1	0	1	0	0	4
		50.0	0.0	0.0	25.0	0.0	25.0	0.0	0.0	4.0
		3.6	0.0	0.0	4.5	0.0	20.0	0.0	0.0	
		2.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	
8 X 26	826.	18	0	1	2	1	3	7	3	35
		51.4	0.0	2.9	5.7	2.9	8.6	20.0	8.6	35.0
		32.1	0.0	100.0	9.1	20.0	60.0	100.0	100.0	
		18.0	0.0	1.0	2.0	1.0	3.0	7.0	3.0	
9 X 32	932.	0	1	0	5	4	0	0	0	10
		0.0	10.0	0.0	50.0	40.0	0.0	0.0	0.0	10.0
		0.0	100.0	0.0	22.7	80.0	0.0	0.0	0.0	
		0.0	1.0	0.0	5.0	4.0	0.0	0.0	0.0	
9 X 34	934.	1	0	0	0	0	0	0	0	1
		100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
		1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
		1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
9 X 38	938.	0	0	0	9	0	0	0	0	9
		0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	9.0
		0.0	0.0	0.0	40.9	0.0	0.0	0.0	0.0	
		0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	
	COLUMN TOTAL	56	1	1	22	5	5	7	3	100
		56.0	1.0	1.0	22.0	5.0	5.0	7.0	3.0	100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * * *
VAR004 BUOY SIZE BY VAR023 FIRST CHAIN SIZE
* PAGE 1 OF 2

VAR004	COUNT / ROW PCT / COL PCT / TOT PCT	VAR023 0.	1" 4.	1 1-4" 6.	1 1-2" 7.	1 5-8"AND LARGER 8.	ROW TOTAL
AID DISCONTINUED	0.	1 100.0 100.0 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
10 X 39	39.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 20.0 2.8 1.0	4 80.0 11.4 4.0	5 5.0
5 X 10	510.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 3.7 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
6 X 20	620.	0 0.0 0.0 0.0	1 11.1 100.0 1.0	8 88.9 29.6 8.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	9 9.0
7 X 15	715.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	9 69.2 33.3 9.0	3 23.1 8.3 3.0	1 7.7 2.9 1.0	13 13.0
7 X 17	717.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	7 63.6 25.9 7.0	4 36.4 11.1 4.0	0 0.0 0.0 0.0	11 11.0
8 X 20	820.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 2.8 1.0	0 0.0 0.0 0.0	1 1.0
	COLUMN TOTAL	1 1.0	1 1.0	27 27.0	36 36.0	35 35.0	100 100.0

(CONTINUED)

FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR004 BUOY SIZE BY VAR023 FIRST CHAIN SIZE
* PAGE 2 OF 2

VAR004	VAR023 COUNT / ROW PCT / COL PCT / TOT PCT	0.	1" 4.	1 1-4" 6.	1 1-2" 7.	1 5-8"AND LARGER 8.	ROW TOTAL
8 X 23	823.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 50.0 5.6 2.0	2 50.0 5.7 2.0	4 4.0
8 X 26	826.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 5.7 7.4 2.0	23 65.7 63.9 23.0	10 28.6 28.6 10.0	35 35.0
9 X 32	932.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 10.0 2.8 1.0	9 90.0 25.7 9.0	10 10.0
9 X 34	934.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 2.9 1.0	1 1.0
9 X 38	938.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 11.1 2.8 1.0	8 88.9 22.9 8.0	9 9.0
	COLUMN TOTAL	1 1.0	1 1.0	27 27.0	36 36.0	35 35.0	100 100.0

FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* C R O S S T A B U L A T I O N O F *
VAR015 FLASHER BY VAR007 LIGHT CHARACTERISTIC
* PAGE 1 OF 1

VAR015	COUNT / ROW PCT / COL PCT / TOT PCT	VAR007 0.	QK FL 0.3 103.	QK FL * ALLOTHER 122.	MO A.4FL .6EC,2.0 145.	MO A*ALL OTHERS 146.	FL 2.5 .05* 251.	FL 2.5 .5** 255.	FL 4 .4 404.	E INT 6 3.0 630.	ROW TOTAL
	0.	1	0	0	0	0	0	0	0	0	1
		100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
		100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
		1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
C-R S-1065 SS	65.	0	3	1	0	2	0	0	16	0	22
		0.0	13.6	4.5	0.0	9.1	0.0	0.0	72.7	0.0	22.0
		0.0	23.1	100.0	0.0	33.3	0.0	0.0	21.9	0.0	
		0.0	3.0	1.0	0.0	2.0	0.0	0.0	16.0	0.0	
CG-181 C-R DEV.	81.	0	10	0	2	3	2	1	53	1	72
		0.0	13.9	0.0	2.8	4.2	2.8	1.4	73.6	1.4	72.0
		0.0	76.9	0.0	100.0	50.0	100.0	100.0	72.6	100.0	
		0.0	10.0	0.0	2.0	3.0	2.0	1.0	53.0	1.0	
VAPAIR	83.	0	0	0	0	1	0	0	4	0	5
		0.0	0.0	0.0	0.0	20.0	0.0	0.0	80.0	0.0	5.0
		0.0	0.0	0.0	0.0	16.7	0.0	0.0	5.5	0.0	
		0.0	0.0	0.0	0.0	1.0	0.0	0.0	4.0	0.0	
	COLUMN TOTAL	1	13	1	2	6	2	1	73	1	100
		1.0	13.0	1.0	2.0	6.0	2.0	1.0	73.0	1.0	100.0

FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *

VAR010 LANTERN-OPTIC BY VAR017 DAYLIGHT CONTROL

* PAGE 1 OF 1

VAR010	COUNT / ROW PCT / COL PCT / TOT PCT	VAR017 0.	CR-S1065 -LS1 11.	C-CLEAR-ALL 31.	R-COLOR PLASTIC 32.	B-COLOR GLASS 33.	ROW TOTAL
	0.	1 100.0 100.0 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
155 MM ACRYLIC	16.	0 0.0 0.0 0.0	2 2.5 100.0 2.0	39 49.4 83.0 39.0	36 45.6 92.3 36.0	2 2.5 18.2 2.0	79 79.0
200 MM P.GLASS	20.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	7 43.8 14.9 7.0	3 18.8 7.7 3.0	6 37.5 54.5 6.0	16 16.0
200 MM ALLOTHER	23.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 25.0 2.1 1.0	0 0.0 0.0 0.0	3 75.0 27.3 3.0	4 4.0
	COLUMN TOTAL	1 1.0	2 2.0	47 47.0	39 39.0	11 11.0	100 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR005 CONSTRUCTION

CODE	0.	11.	12.	17.	18.
ABSOLUTE FREQUENCY	1	72	3	6	2
RELATIVE FREQUENCY (PERCENT)	1.0	72.0	3.0	6.0	2.0
CUMULATIVE FREQUENCY (PERCENT)	1.0	73.0	76.0	82.0	84.0

CODE	51.	52.	54.	57.	58.
ABSOLUTE FREQUENCY	7	1	1	5	2
RELATIVE FREQUENCY (PERCENT)	7.0	1.0	1.0	5.0	2.0
CUMULATIVE FREQUENCY (PERCENT)	91.0	92.0	93.0	98.0	100.0

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 0 OR 0.0 PERCENT OF TOTAL

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FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR024 FIRST CHAIN LENGTH IN FATHOMS

CODE	0.	7.	15.	17.	18.
ABSOLUTE FREQUENCY	1	2	36	1	1
RELATIVE FREQUENCY (PERCENT)	1.0	2.0	36.0	1.0	1.0
CUMULATIVE FREQUENCY (PERCENT)	1.0	3.0	39.0	40.0	41.0
CODE	20.	22.	23.	24.	25.
ABSOLUTE FREQUENCY	2	5	4	1	4
RELATIVE FREQUENCY (PERCENT)	2.0	5.0	4.0	1.0	4.0
CUMULATIVE FREQUENCY (PERCENT)	43.0	48.0	52.0	53.0	57.0
CODE	26.	28.	30.	33.	38.
ABSOLUTE FREQUENCY	1	2	16	1	1
RELATIVE FREQUENCY (PERCENT)	1.0	2.0	16.0	1.0	1.0
CUMULATIVE FREQUENCY (PERCENT)	58.0	60.0	76.0	77.0	78.0
CODE	44.	45.	48.	50.	52.
ABSOLUTE FREQUENCY	1	8	1	3	1
RELATIVE FREQUENCY (PERCENT)	1.0	8.0	1.0	3.0	1.0
CUMULATIVE FREQUENCY (PERCENT)	79.0	87.0	88.0	91.0	92.0
CODE	57.	58.	60.	88.	99.
ABSOLUTE FREQUENCY	1	1	4	1	1
RELATIVE FREQUENCY (PERCENT)	1.0	1.0	4.0	1.0	1.0
CUMULATIVE FREQUENCY (PERCENT)	93.0	94.0	98.0	99.0	100.0

VALID OBSERVATIONS - 100
MISSING OBSERVATIONS - 0 OR 0.0 PERCENT OF TOTAL

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR071 POWER UNIT,S REPLACED WITH REASON

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	42A	1	0.4	0.8	0.8
	42C	1	0.4	0.8	1.6
	42DX	3	1.1	2.4	4.0
	42DY	1	0.4	0.8	4.8
	42E	8	3.0	6.5	11.3
	42FC	4	1.5	3.2	14.5
	42FD	1	0.4	0.8	15.3
	42FI	1	0.4	0.8	16.1
	42FP	2	0.7	1.6	17.7
	42FS	1	0.4	0.8	18.5
	42G	2	0.7	1.6	20.2
	42K	8	3.0	6.5	26.6
	42L	7	2.6	5.6	32.3
	42M	2	0.7	1.6	33.9
	42QE	2	0.7	1.6	35.5
	42QM	1	0.4	0.8	36.3
	42S	41	15.3	33.1	69.4
	42T	6	2.2	4.8	74.2
	42TB	2	0.7	1.6	75.8
	42W	22	8.2	17.7	93.5
	42X	1	0.4	0.8	94.4
	81DX	1	0.4	0.8	95.2
	81DZ	1	0.4	0.8	96.0
	81FC	5	1.9	4.0	100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR071 POWER UNIT,S REPLACED WITH REASON

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	42A	1	0.4	0.8	0.8
	42C	1	0.4	0.8	1.6
	42DX	3	1.1	2.4	4.0
	42DY	1	0.4	0.8	4.8
	42E	8	3.0	6.5	11.3
	42FC	4	1.5	3.2	14.5
	42FD	1	0.4	0.8	15.3
	42FI	1	0.4	0.8	16.1
	42FP	2	0.7	1.6	17.7
	42FS	1	0.4	0.8	18.5
	42G	2	0.7	1.6	20.2
	42K	8	3.0	6.5	26.6
	42L	7	2.6	5.6	32.3
	42M	2	0.7	1.6	33.9
	42QE	2	0.7	1.6	35.5
	42QM	1	0.4	0.8	36.3
	42S	41	15.3	33.1	69.4
	42T	6	2.2	4.8	74.2
	42TB	2	0.7	1.6	75.8
	42W	22	8.2	17.7	93.5
	42X	1	0.4	0.8	94.4
	81DX	1	0.4	0.8	95.2
	81DZ	1	0.4	0.8	96.0
	81FC	5	1.9	4.0	100.0

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	144	53.7	MISSING	100.0
TOTAL	268	100.0	100.0	100.0

VALID CBSERVATIONS - 124
MISSING CBSERVATIONS - 144

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TOTAL	268	100.0	100.0	100.0

VALID CBSERVATIONS - 66
MISSING CBSERVATIONS - 202

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FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR072 BUOY RELIEVED WITH REASON BY VAR004 BUOY SIZE
* PAGE 1 OF 1

VAR072 / VAR004 (COUNT / ROW PCT / COL PCT / TOT PCT)	6 X 20 (620.)	7 X 15 (715.)	7 X 17 (717.)	8 X 26 (826.)	9 X 32 (932.)	9 X 38 (938.)	ROW TOTAL
C$& COLLISION	2 40.0 100.0 7.4	1 20.0 100.0 3.7	1 20.0 100.0 3.7	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 20.0 33.3 3.7	5 18.5
C$0 WEATHER	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	18 81.8 100.0 66.7	2 9.1 100.0 7.4	2 9.1 66.7 7.4	22 81.5
COLUMN TOTAL	2 7.4	1 3.7	1 3.7	18 66.7	2 7.4	3 11.1	27 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * *
VAR072 BUOY RELIEVED WITH REASON BY VARPER PERCENT EXPECTED BATTERY LIFE USED
* PAGE 1 OF 2

VAR072 (COUNT / ROW PCT / COL PCT / TOT PCT)	VARPER 10.00	30.00	50.00	65.00	75.00	85.00	95.00	115.00	150.00	ROW TOTAL
87PJ	0 0.0 0.0 0.0	2 100.0 20.0 6.7	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 6.7
84W	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 50.0 3.3	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 3.3
43W	6 42.9 60.0 20.0	8 57.1 80.0 26.7	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	14 46.7
43S	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 100.0 3.3	0 0.0 0.0 0.0	1 3.3
43R	2 100.0 20.0 6.7	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 6.7
43PH	1 100.0 10.0 3.3	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 3.3
43M	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 50.0 50.0 3.3	0 0.0 0.0 0.0	1 50.0 50.0 3.3	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 6.7
COLUMN TOTAL	10 33.3	10 33.3	1 3.3	1 3.3	2 6.7	2 6.7	2 6.7	1 3.3	1 3.3	30 100.0

(CONTINUED)

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR072 BUOY RELIEVED WITH REASON BY VARPER PERCENT EXPECTED BATTERY LIFE USED
* PAGE 2 OF 2

VAR072 \ VARPER COUNT ROW PCT COL PCT TOT PCT	10.00	30.00	50.00	65.00	75.00	85.00	95.00	115.00	150.00	ROW TOTAL
43L	1 33.3 10.0 3.3	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 33.3 100.0 3.3	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 33.3 100.0 3.3	3 10.0
43K	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 50.0 3.3	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 3.3
43G	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 100.0 3.3	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 3.3
43FP	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 50.0 3.3	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 3.3
43C	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 50.0 3.3	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 3.3
COLUMN TOTAL	10 33.3	10 33.3	1 3.3	1 3.3	2 6.7	2 6.7	2 6.7	1 3.3	1 3.3	30 100.0

NUMBER OF MISSING OBSERVATIONS = 238

FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * C R O S S T A B U L A T I O N O F * * * * *
VAR072 BUOY RELIEVED WITH REASON BY VAR003 LOCATION
* * * * * PAGE 1 OF 1

VAR072 / VAR003 (COUNT / ROW PCT / COL PCT / TOT PCT)	PROTECTED RIVER U	BAY,HARB OR PROTE T	EXPOSED RIVER D	EXPOSED SEA COAS B	ROW TOTAL
C$& COLLISION	3 60.0 100.0 10.7	1 20.0 100.0 3.6	1 20.0 50.0 3.6	0 0.0 0.0 0.0	5 17.9
C$0 WEATHER	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 4.3 50.0 3.6	22 95.7 100.0 78.6	23 82.1
COLUMN TOTAL	3 10.7	1 3.6	2 7.1	22 78.6	28 100.0

FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * C R O S S T A B U L A T I O N O F * * * * *
VAR072 BUOY RELIEVED WITH REASON BY VAR051 J.DATE WORK PERFORMED-OR 3365END
* * * * * PAGE 1 OF 3

VAR072 / VAR051 (COUNT / ROW PCT / COL PCT / TOT PCT)	2025.	2028.	2029.	2030.	2032.	2035.	2055.	2056.	2087.	2088.	ROW TOTAL
C$& COLLISION	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 20.0 100.0 3.7	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	5 18.5
C$0 WEATHER	1 4.5 100.0 3.7	1 4.5 100.0 3.7	1 4.5 100.0 3.7	1 4.5 100.0 3.7	0 0.0 0.0 0.0	1 4.5 100.0 3.7	1 4.5 100.0 3.7	1 4.5 100.0 3.7	1 4.5 100.0 3.7	1 4.5 100.0 3.7	22 81.5
COLUMN TOTAL	1 3.7	1 3.7	1 3.7	1 3.7	1 3.7	1 3.7	1 3.7	1 3.7	1 3.7	1 3.7	27 100.0

(CONTINUED)

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR072 BUOY RELIEVED WITH REASON BY VAR051 J.DATE WORK PERFORMED-OR 3365END
* PAGE 2 OF 3

VAR072 / VAR051 (COUNT, ROW PCT, COL PCT, TOT PCT)	2089.	2109.	2138.	2190.	2318.	2362.	3004.	3005.	3017.	3029.	ROW TOTAL
C$E COLLISION	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 20.0 100.0 3.7	1 20.0 100.0 3.7	0 0.0 0.0 0.0	2 40.0 100.0 7.4	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	5 18.5
C$O WEATHER	1 4.5 100.0 3.7	1 4.5 100.0 3.7	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 4.5 100.0 3.7	0 0.0 0.0 0.0	1 4.5 100.0 3.7	1 4.5 100.0 3.7	1 4.5 100.0 3.7	3 13.6 100.0 11.1	22 81.5
COLUMN TOTAL	1 3.7	1 3.7	1 3.7	1 3.7	1 3.7	2 7.4	1 3.7	1 3.7	1 3.7	3 11.1	27 100.0

(CONTINUED)

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR072 BUOY RELIEVED WITH REASON BY VAR051 J.DATE WORK PERFORMED-OR 3365END
* PAGE 3 OF 3

VAR072 / VAR051 (COUNT, ROW PCT, COL PCT, TOT PCT)	3039.	3080.	3334.	ROW TOTAL
C$E COLLISION	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	5 18.5
C$O WEATHER	1 4.5 100.0 3.7	1 4.5 100.0 3.7	2 9.1 100.0 7.4	22 81.5
COLUMN TOTAL	1 3.7	1 3.7	2 7.4	27 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST
VARIABLE VAR073 FLASHER REPLACED WITH REASON

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	46C	1	0.4	1.1	1.1
	46DN	1	0.4	1.1	2.1
	46DZ	4	1.5	4.3	6.4
	46E	8	3.0	8.5	14.9
	46FC	5	1.9	5.3	20.2
	46FD	1	0.4	1.1	21.3
	46FI	2	0.7	2.1	23.4
	46FW	1	0.4	1.1	24.5
	46G	2	0.7	2.1	26.6
	46J	2	0.7	2.1	28.7
	46K	17	6.3	18.1	46.8
	46L	12	4.5	12.8	59.6
	46M	4	1.5	4.3	63.8
	46N	4	1.5	4.3	68.1
	46O	2	0.7	2.1	70.2
	46R	4	1.5	4.3	74.5
	46TB	2	0.7	2.1	76.6
	46VB	1	0.4	1.1	77.7
	46W	20	7.5	21.3	98.9
	46ZG	1	0.4	1.1	100.0
		174	64.9	MISSING	100.0
	TOTAL	268	100.0	100.0	100.0

VALID OBSERVATIONS - 94
MISSING OBSERVATIONS - 174

FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR073 FLASHER REPLACED WITH REASON BY VAR001 LIGHT LIST NUMBER
* PAGE 1 OF 2

VAR073 / VAR001 (COUNT, ROW PCT, COL PCT, TOT PCT)	1260.00	1274.00	1396.00	1400.00	1413.00	1422.00	1431.00	1488.00	1506.00	1509.00	ROW TOTAL
C)- COLLISION	1 8.3 100.0 8.3	1 8.3 100.0 8.3	1 8.3 100.0 8.3	1 8.3 100.0 8.3	1 8.3 100.0 8.3	1 8.3 100.0 8.3	2 16.7 100.0 16.7	1 8.3 100.0 8.3	1 8.3 100.0 8.3	1 8.3 100.0 8.3	12 100.0
COLUMN TOTAL	1 8.3	1 8.3	1 8.3	1 8.3	1 8.3	1 8.3	2 16.7	1 8.3	1 8.3	1 8.3	12 100.0

(CONTINUED)

FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR073 FLASHER REPLACED WITH REASON BY VAR001 LIGHT LIST NUMBER
* PAGE 2 OF 2

VAR073 / VAR001 (COUNT, ROW PCT, COL PCT, TOT PCT)	1514.00	ROW TOTAL
C)- COLLISION	1 8.3 100.0 8.3	12 100.0
COLUMN TOTAL	1 8.3	12 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR070 NO.BURNED OUT LAMPS REPLACED

CODE	0.	1.	2.	3.	4.
ABSOLUTE FREQUENCY	103	24	18	9	62
RELATIVE FREQUENCY (PERCENT)	38.4	9.0	6.7	3.4	23.1
CUMULATIVE FREQUENCY (PERCENT)	38.4	47.4	54.1	57.5	80.6

CODE	5.	6.	7.	8.	10.
ABSOLUTE FREQUENCY	9	36	2	1	1
RELATIVE FREQUENCY (PERCENT)	3.4	13.4	0.7	0.4	0.4
CUMULATIVE FREQUENCY (PERCENT)	84.0	97.4	98.1	98.5	98.9

CODE	11.	13.	16.
ABSOLUTE FREQUENCY	1	1	1
RELATIVE FREQUENCY (PERCENT)	0.4	0.4	0.4
CUMULATIVE FREQUENCY (PERCENT)	99.3	99.6	100.0

VALID OBSERVATIONS - 268
MISSING OBSERVATIONS - 0 OR 0.0 PERCENT OF TOTAL

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR074 LAMPCHANGER REPLACED WITH REASON

CODE	47C	47DN	47DZ	47E	47FC
ABSOLUTE FREQUENCY	1	1	4	8	7
RELATIVE FREQUENCY (PERCENT)	1.1	1.1	4.4	8.8	7.7
CUMULATIVE FREQUENCY (PERCENT)	1.1	2.2	6.6	15.4	23.1

CODE	47FI	47FR	47G	47J	47K
ABSOLUTE FREQUENCY	1	1	2	1	17
RELATIVE FREQUENCY (PERCENT)	1.1	1.1	2.2	1.1	18.7
CUMULATIVE FREQUENCY (PERCENT)	24.2	25.3	27.5	28.6	47.3

CODE	47L	47M	47N	47O	47R
ABSOLUTE FREQUENCY	12	4	4	2	2
RELATIVE FREQUENCY (PERCENT)	13.2	4.4	4.4	2.2	2.2
CUMULATIVE FREQUENCY (PERCENT)	60.4	64.8	69.2	71.4	73.6

CODE	47TB	47VB	47W	47ZG
ABSOLUTE FREQUENCY	2	1	20	1
RELATIVE FREQUENCY (PERCENT)	2.2	1.1	22.0	1.1
CUMULATIVE FREQUENCY (PERCENT)	75.8	76.9	98.9	100.0

MISSING VALUES..

CODE	
ABSOLUTE FREQUENCY	177

VALID OBSERVATIONS - 91
MISSING OBSERVATIONS - 177 OR 66.0 PERCENT OF TOTAL

FILE ATCNAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR076 LANTERN-CPTIC REP.WITH REASON BY VAR001 LIGHT LIST NUMBER
* PAGE 1 OF 1

VAR076 \\ VAR001	COUNT ROW PCT COL PCT TOT PCT	1420.00	1432.00	1447.00	1449.00	1451.00	1460.00	1480.00	1502.00	1509.00	1514.00	ROW TOTAL
DLZ OPORDER 067-71		1 100.0 100.0 10.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 10.0
DMG OPORDER 152-72		0 0.0 0.0 0.0	1 11.1 100.0 10.0	1 11.1 100.0 10.0	1 11.1 100.0 10.0	1 11.1 100.0 10.0	1 11.1 100.0 10.0	1 11.1 100.0 10.0	1 11.1 100.0 10.0	1 11.1 100.0 10.0	1 11.1 100.0 10.0	9 90.0
COLUMN TOTAL		1 10.0	1 10.0	1 10.0	1 10.0	1 10.0	1 10.0	1 10.0	1 10.0	1 10.0	1 10.0	10 100.0

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR078 MAIN CAUSE FOR FAILURE OR RELATED NOTE

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
POWER-BATTERY	22.	13	4.9	10.6	10.6
TARDY SERVICE	23.	1	0.4	0.8	11.4
FLOODED	26.	6	2.2	4.9	16.3
WEATHER	28.	41	15.3	33.3	49.6
COLLISION	30.	19	7.1	15.4	65.0
VANDALISM	31.	2	0.7	1.6	66.7
UNKNOWN	33.	8	3.0	6.5	73.2
ALL LAMPS	45.	7	2.6	5.7	78.9
FLASHER	46.	8	3.0	6.5	85.4
LAMPCHANGER	47.	6	2.2	4.9	90.2
WIRING	58.	5	1.9	4.1	94.3
FIRST CHAIN	61.	2	0.7	1.6	95.9
SINKER	63.	2	0.7	1.6	97.6
BUOY DETIORATION	69.	3	1.1	2.4	100.0
NONE	0.	145	54.1	MISSING	100.0
	TOTAL	268	100.0	100.0	100.0

VALID OBSERVATIONS - 123
MISSING OBSERVATIONS - 145

CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING 01/14/75 PAGE 92

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR079 MAIN CAUSE FOR FAILURE OR RELATED NOTE

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
FALSE ALARM	3.	8	3.0	13.1	13.1
PERSONNEL ERROR	24.	9	3.4	14.8	27.9
WORN-BKN MOORINGS	25.	8	3.0	13.1	41.0
UNKNOWN	33.	2	0.7	3.3	44.3
DAYLIGHT CONTROL	50.	7	2.6	11.5	55.7
LANTERN	51.	1	0.4	1.6	57.4
SOUND SIGNAL	52.	1	0.4	1.6	59.0
SHACKLE	59.	1	0.4	1.6	60.7
MOORINGS RPLD PVOS	70.	3	1.1	4.9	65.6
POCK COV MSG	72.	1	0.4	1.6	67.2
COBN WX,VDZ,UKN,PE	81.	3	1.1	4.9	72.1
2ND CONSCV DISCY	84.	4	1.5	6.6	76.7
3RD + CONSCV DISCY	85.	12	4.5	19.7	98.4
VEE BAND	92.	1	0.4	1.6	100.0
NONE	0.	207	77.2	MISSING	100.0
	TOTAL	268	100.0	100.0	100.0

VALID OBSERVATIONS - 61
MISSING OBSERVATIONS - 207

FILE ATONAV13 (CREATION DATE = 01/14/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR080 COMPONENT LOST-DAMAGED DURING SERVICING

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
BUOY LOST NOT SALVGD	BL	7	2.6	29.2	29.2
BY FOUND OR SALVGD	BY	13	4.9	54.2	83.3
LOST MOORINGS	LM	3	1.1	12.5	95.8
BUOY NOT FOUND	MI	1	0.4	4.2	100.0
		244	91.0	MISSING	100.0
	TOTAL	268	100.0	100.0	100.0

VALID OBSERVATIONS - 24
MISSING OBSERVATIONS - 244

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST
VARIABLE VAR071 POWER UNIT,S REPLACED WITH REASON

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
ROUTINE SERVICING	421.	43	34.7	34.7	34.7
ENVRNMTL HAZARDS	422.	37	29.8	29.8	64.5
TECH- ADMIN ERRORS	423.	1	0.8	0.8	65.3
PERSONNEL ERRORS	424.	15	12.1	12.1	77.4
CONVENIENCE-FOLLOWP	426.	18	14.5	14.5	91.9
MANUFCTRG ERRORS	427.	10	8.1	8.1	100.0
	0.	0	0.0	MISSING	100.0
	TOTAL	124	100.0	100.0	100.0

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CCDEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING                    01/15/75        PAGE   11
FILE   ATONAV13 (CREATICN DATE = 01/15/75)   100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST
VARIABLE   VAR071     POWER UNIT,S REPLACED WITH REASON
      CODE
             I
      421.   *************************************************************************************** (     43)  34.7 PCT
             I     ROUTINE SERVICING
             I
             I
      422.   *************************************************************************** (     37)  29.8 PCT
             I     ENVRNMTL HAZARDS
             I
             I
      423.   *** (      1)   0.8 PCT
             I     TECH- ADMIN ERRORS
             I
             I
      424.   ******************************* (     15)  12.1 PCT
             I     PERSONNEL ERRORS
             I
             I
      426.   ************************************* (     18)  14.5 PCT
             I     CONVENIENCE-FOLLOWP
             I
             I
      427.   ********************* (     10)   8.1 PCT
             I     MANUFCTRG ERRORS
             I
             I
        0.   * (      0)   0.0 PCT
 (MISSING)   I
             I
             I.........I.........I.........I.........I.........I.........I.........I.........I.........I.........I
             0         5        10        15        20        25        30        35        40        45        50
             FREQUENCY

VALID   OBSERVATIONS -       124
MISSING OBSERVATIONS -         0
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FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

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VAR071 POWER UNIT,S REPLACED WITH REASON BY VAR007 LIGHT CHARACTERISTIC

* PAGE 1 OF 1

VAR071	COUNT / ROW PCT / COL PCT / TOT PCT	VAR007: QK FL 0.3 (103.)	MO A.4FL .6EC,2.0 (145.)	MO A*ALL OTHERS (146.)	FL 2.5 .05* (251.)	FL 2.5 .5** (255.)	FL 4 .4 (404.)	E INT 6 3.0 (630.)	ROW TOTAL
422. ENVRNMTL HAZARDS	COUNT	5	2	0	2	0	26	2	37
	ROW PCT	13.5	5.4	0.0	5.4	0.0	70.3	5.4	59.7
	COL PCT	45.5	100.0	0.0	100.0	0.0	61.9	100.0	
	TOT PCT	8.1	3.2	0.0	3.2	0.0	41.9	3.2	
424. PERSONNEL ERRORS	COUNT	5	0	0	0	1	9	0	15
	ROW PCT	33.3	0.0	0.0	0.0	6.7	60.0	0.0	24.2
	COL PCT	45.5	0.0	0.0	0.0	100.0	21.4	0.0	
	TOT PCT	8.1	0.0	0.0	0.0	1.6	14.5	0.0	
427. MANUFCTRG ERRORS	COUNT	1	0	2	0	0	7	0	10
	ROW PCT	10.0	0.0	20.0	0.0	0.0	70.0	0.0	16.1
	COL PCT	9.1	0.0	100.0	0.0	0.0	16.7	0.0	
	TOT PCT	1.6	0.0	3.2	0.0	0.0	11.3	0.0	
COLUMN TOTAL		11	2	2	2	1	42	2	62
		17.7	3.2	3.2	3.2	1.6	67.7	3.2	100.0

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * C R O S S T A B U L A T I O N O F * * * * *
VAR071 POWER UNIT,S REPLACED WITH REASON BY VAR003 LOCATION

VAR071 (COUNT / ROW PCT / COL PCT / TOT PCT)	VAR003: PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPOSED SEA COAS B	ROW TOTAL
422. ENVRNMTL HAZARDS	6 16.2 42.9 9.7	1 2.7 25.0 1.6	0 0.0 0.0 0.0	0 0.0 0.0 0.0	3 8.1 60.0 4.3	27 73.0 79.4 43.5	37 59.7
424. PERSONNEL ERRORS	4 26.7 28.6 6.5	2 13.3 50.0 3.2	3 20.0 75.0 4.8	1 6.7 100.0 1.6	2 13.3 40.0 3.2	3 20.0 8.8 4.8	15 24.2
427. MANUFCTRG ERRORS	4 40.0 28.6 6.5	1 10.0 25.0 1.6	1 10.0 25.0 1.6	0 0.0 0.0 0.0	0 0.0 0.0 0.0	4 40.0 11.8 6.5	10 16.1
COLUMN TOTAL	14 22.6	4 6.5	4 6.5	1 1.6	5 8.1	34 54.8	62 100.0

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR071 POWER UNIT,S REPLACED WITH REASON BY VAR004 BUOY SIZE
* PAGE 1 OF 1

VAR071	COUNT / ROW PCT / COL PCT / TOT PCT	VAR004: 10 X 39 (39.)	5 X 10 (510.)	6 X 20 (620.)	7 X 15 (715.)	7 X 17 (717.)	8 X 20 (820.)	8 X 23 (823.)	8 X 26 (826.)	9 X 32 (932.)	9 X 38 (938.)	ROW TOTAL
422. ENVRNMTL HAZARDS	COUNT	1	0	3	2	2	1	0	23	2	3	37
	ROW PCT	2.7	0.0	8.1	5.4	5.4	2.7	0.0	62.2	5.4	8.1	59.7
	COL PCT	50.0	0.0	50.0	33.3	50.0	100.0	0.0	82.1	40.0	42.9	
	TOT PCT	1.6	0.0	4.8	3.2	3.2	1.6	0.0	37.1	3.2	4.8	
424. PERSONNEL ERRORS	COUNT	0	0	2	1	2	0	2	4	2	2	15
	ROW PCT	0.0	0.0	13.3	6.7	13.3	0.0	13.3	26.7	13.3	13.3	24.2
	COL PCT	0.0	0.0	33.3	16.7	50.0	0.0	100.0	14.3	40.0	28.6	
	TOT PCT	0.0	0.0	3.2	1.6	3.2	0.0	3.2	6.5	3.2	3.2	
427. MANUFCTRG ERRORS	COUNT	1	1	1	3	0	0	0	1	1	2	10
	ROW PCT	10.0	10.0	10.0	30.0	0.0	0.0	0.0	10.0	10.0	20.0	16.1
	COL PCT	50.0	100.0	16.7	50.0	0.0	0.0	0.0	3.6	20.0	28.6	
	TOT PCT	1.6	1.6	1.6	4.8	0.0	0.0	0.0	1.6	1.6	3.2	
COLUMN TOTAL		2	1	6	6	4	1	2	28	5	7	62
		3.2	1.6	9.7	9.7	6.5	1.6	3.2	45.2	8.1	11.3	100.0

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR071 POWER UNIT,S REPLACED WITH REASON BY VAR006 VENT VALVES PER POCKET
* PAGE 1 OF 1

VAR071 (COUNT / ROW PCT / COL PCT / TOT PCT)	VAR006: 1,BALL INSTALLED 1.	2,BALLS INSTLD 2.	1 VENT, NO BALLS 3.	ROW TOTAL
422. ENVRNMTL HAZARDS	35	0	2	37
	94.6	0.0	5.4	59.7
	62.5	0.0	40.0	
	56.5	0.0	3.2	
424. PERSONNEL ERRORS	13	0	2	15
	86.7	0.0	13.3	24.2
	23.2	0.0	40.0	
	21.0	0.0	3.2	
427. MANUFCTRG ERRORS	8	1	1	10
	80.0	10.0	10.0	16.1
	14.3	100.0	20.0	
	12.9	1.6	1.6	
COLUMN TOTAL	56	1	5	62
	90.3	1.6	8.1	100.0

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * C R O S S T A B U L A T I O N O F * * *
VAR071 POWER UNIT,S REPLACED WITH REASON BY VAR012 POWER SOURCE-BATTERY
* * *

VAR071 (COUNT / ROW PCT / COL PCT / TOT PCT)	VAR012: 6000 A-H ,2EDSN#2 60E2	5000A-H, EDISON-O 50BY	3000 A-H ,EDISON# 30E2	2500 A-H ,EDISON- 25BY	2000 A-H ,2 EDSN 20S1	1000 A-H ,2EDISON 20JS	2000 A-H ,2EDISON 20E2	1000 A-H ,EDISON# 10E2	ROW TOTAL
422. ENVRNMTL HAZARDS	4 10.8 66.7 6.5	3 8.1 42.9 4.8	2 5.4 66.7 3.2	3 8.1 42.9 4.8	1 2.7 100.0 1.6	1 2.7 25.0 1.6	21 56.8 72.4 33.9	2 5.4 40.0 3.2	37 59.7
424. PERSONNEL ERRORS	1 6.7 16.7 1.6	2 13.3 28.6 3.2	1 6.7 33.3 1.6	3 20.0 42.9 4.8	0 0.0 0.0 0.0	0 0.0 0.0 0.0	6 40.0 20.7 9.7	2 13.3 40.0 3.2	15 24.2
427. MANUFCTRG ERRORS	1 10.0 16.7 1.6	2 20.0 28.6 3.2	0 0.0 0.0 0.0	1 10.0 14.3 1.6	0 0.0 0.0 0.0	3 30.0 75.0 4.8	2 20.0 6.9 3.2	1 10.0 20.0 1.6	10 16.1
COLUMN TOTAL	6 9.7	7 11.3	3 4.8	7 11.3	1 1.6	4 6.5	29 46.8	5 8.1	62 100.0

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

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VAR071 POWER UNIT,S REPLACED WITH REASON BY VAR014 LAMPCHANGER
* PAGE 1 OF 1

VAR071	VAR014 COUNT ROW PCT COL PCT TOT PCT	6 LAMP,C GCP CRDC 65.	4 LAMP,F U-1297 97.	ROW TOTAL
ENVRNMTL HAZARDS	422.	10 27.0 76.9 16.1	27 73.0 55.1 43.5	37 59.7
PERSCNNEL ERRORS	424.	3 20.0 23.1 4.8	12 80.0 24.5 19.4	15 24.2
MANUFCTRG ERRORS	427.	0 0.0 0.0 0.0	10 100.0 20.4 16.1	10 16.1
	COLUMN TOTAL	13 21.0	49 79.0	62 100.0

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

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VAR071 POWER UNIT,S REPLACED WITH REASON BY VAR015 FLASHER
* PAGE 1 OF 1

VAR071	COUNT / ROW PCT / COL PCT / TOT PCT	VAR015: C-R S-10 65 SS 65.	CG-181 C -R DEV. 81.	VAPAIR 83.	ROW TOTAL
ENVRNMTL HAZARDS	422.	5	32	0	37
		13.5	86.5	0.0	59.7
		38.5	68.1	0.0	
		8.1	51.6	0.0	
PERSONNEL ERRORS	424.	4	9	2	15
		26.7	60.0	13.3	24.2
		30.8	19.1	100.0	
		6.5	14.5	3.2	
MANUFCTRG ERRORS	427.	4	6	0	10
		40.0	60.0	0.0	16.1
		30.8	12.8	0.0	
		6.5	9.7	0.0	
	COLUMN TOTAL	13	47	2	62
		21.0	75.8	3.2	100.0

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * C R O S S T A B U L A T I O N O F * * * * *

VAR071 POWER UNIT,S REPLACED WITH REASON BY VAR016 SOUND SIGNAL

* * * * * PAGE 1 OF 1

VAR071 (COUNT / ROW PCT / COL PCT / TOT PCT)	NO SOUND SIGNAL 0.	ELECTRIC HORN850 40.	WHISTLE 4 BALL 79.	BELL PRE 1952 TP 81.	BELL1952 TAPPER 82.	BELL1962 TAPPER 83.	GONG1952 TAPPER 85.	GONG1962 TAPPER 86.	ROW TOTAL
422. ENVRNMTL HAZARDS	15 40.5 53.6 24.2	0 0.0 0.0 0.0	10 27.0 58.8 16.1	0 0.0 0.0 0.0	3 8.1 75.0 4.8	3 8.1 75.0 4.8	1 2.7 100.0 1.6	5 13.5 83.3 8.1	37 59.7
424. PERSONNEL ERRORS	7 46.7 25.0 11.3	1 6.7 100.0 1.6	4 26.7 23.5 6.5	0 0.0 0.0 0.0	1 6.7 25.0 1.6	1 6.7 25.0 1.6	0 0.0 0.0 0.0	1 6.7 16.7 1.6	15 24.2
427. MANUFCTRG ERRORS	6 60.0 21.4 9.7	0 0.0 0.0 0.0	3 30.0 17.6 4.8	1 10.0 100.0 1.6	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	10 16.1
COLUMN TOTAL	28 45.2	1 1.6	17 27.4	1 1.6	4 6.5	4 6.5	1 1.6	6 9.7	62 100.0

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * C R O S S T A B U L A T I O N O F * * * * *

VAR071 POWER UNIT,S REPLACED WITH REASON BY VAR017 DAYLIGHT CONTROL

VAR071 \ VAR017 (COUNT / ROW PCT / COL PCT / TOT PCT)	CR-S1065-LS MNTD 13.	C-CLEAR-ALL 31.	R-COLOR PLASTIC 32.	B-COLOR GLASS 33.	ROW TOTAL
422. ENVRNMTL HAZARDS	1 2.7 100.0 1.6	19 51.4 63.3 30.6	13 35.1 65.0 21.0	4 10.8 36.4 6.5	37 59.7
424. PERSONNEL ERRORS	0 0.0 0.0 0.0	4 26.7 13.3 6.5	6 40.0 30.0 9.7	5 33.3 45.5 8.1	15 24.2
427. MANUFCTRG ERRORS	0 0.0 0.0 0.0	7 70.0 23.3 11.3	1 10.0 5.0 1.6	2 20.0 18.2 3.2	10 16.1
COLUMN TOTAL	1 1.6	30 48.4	20 32.3	11 17.7	62 100.0

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

C R O S S T A B U L A T I O N O F VAR071 POWER UNIT,S REPLACED WITH REASON BY VAR018 BOTTOM DESCRIPTION

VAR071	COUNT / ROW PCT / COL PCT / TOT PCT	VAR018 SAND S	ROCK R	MUD M	GRAVEL G	ROW TOTAL
422. ENVRNMTL HAZARDS	COUNT	25	6	4	2	37
	ROW PCT	67.6	16.2	10.8	5.4	59.7
	COL PCT	65.8	85.7	30.8	50.0	
	TOT PCT	40.3	9.7	6.5	3.2	
424. PERSONNEL ERRORS	COUNT	9	1	4	1	15
	ROW PCT	60.0	6.7	26.7	6.7	24.2
	COL PCT	23.7	14.3	30.8	25.0	
	TOT PCT	14.5	1.6	6.5	1.6	
427. MANUFCTRG ERRORS	COUNT	4	0	5	1	10
	ROW PCT	40.0	0.0	50.0	10.0	16.1
	COL PCT	10.5	0.0	38.5	25.0	
	TOT PCT	6.5	0.0	8.1	1.6	
COLUMN TOTAL		38	7	13	4	62
		61.3	11.3	21.0	6.5	100.0

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

C R O S S T A B U L A T I O N O F
VAR071 POWER UNIT,S REPLACED WITH REASON BY VAR021 BRIDLE SIZE

VAR071 (COUNT / ROW PCT / COL PCT / TOT PCT)	VAR021: 1" X12' 2.	1" X 15' 3.	1 1-4" X 15' 4.	1 1-2" X 18' 6.	1 1-2" X 26' 7.	ROW TOTAL
422. ENVRNMTL HAZARDS	2 5.4 40.0 3.2	1 2.7 100.0 1.6	28 75.7 66.7 45.2	2 5.4 33.3 3.2	4 10.8 50.0 6.5	37 59.7
424. PERSCNNEL ERRORS	1 6.7 20.0 1.6	0 0.0 0.0 0.0	10 66.7 23.8 16.1	2 13.3 33.3 3.2	2 13.3 25.0 3.2	15 24.2
427. MANUFCTRG ERRORS	2 20.0 40.0 3.2	0 0.0 0.0 0.0	4 40.0 9.5 6.5	2 20.0 33.3 3.2	2 20.0 25.0 3.2	10 16.1
COLUMN TOTAL	5 8.1	1 1.6	42 67.7	6 9.7	8 12.9	62 100.0

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

C R O S S T A B U L A T I O N O F
VAR071 POWER UNIT,S REPLACED WITH REASON BY VAR022 SWIVEL SIZE AND NUMBER

PAGE 1 OF 1

VAR071 \ VAR022 (COUNT / ROW PCT / COL PCT / TOT PCT)	1 1-2" 3RD CLASS 2.	1 3-4" 2ND CLASS 3.	2" 1ST CLASS 4.	ROW TOTAL
ENVRNMTL HAZARDS 422.	4 10.8 57.1 6.5	27 73.0 64.3 43.5	6 16.2 46.2 9.7	37 59.7
PERSONNEL ERRORS 424.	1 6.7 14.3 1.6	10 66.7 23.8 16.1	4 26.7 30.8 6.5	15 24.2
MANUFCTRG ERRORS 427.	2 20.0 28.6 3.2	5 50.0 11.9 8.1	3 30.0 23.1 4.8	10 16.1
COLUMN TOTAL	7 11.3	42 67.7	13 21.0	62 100.0

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

CROSSTABULATION OF VAR071 POWER UNIT,S REPLACED WITH REASON BY VAR023 FIRST CHAIN SIZE

VAR071 (COUNT / ROW PCT / COL PCT / TOT PCT)	VAR023: 1 1-4" 6.	1 1-2" 7.	1 5-8"AND LARGER 8.	ROW TOTAL
422. ENVRNMTL HAZARDS	6 16.2 40.0 9.7	7 18.9 50.0 11.3	24 64.9 72.7 38.7	37 59.7
424. PERSONNEL ERRORS	4 26.7 26.7 6.5	5 33.3 35.7 8.1	6 40.0 18.2 9.7	15 24.2
427. MANUFCTRG ERRORS	5 50.0 33.3 8.1	2 20.0 14.3 3.2	3 30.0 9.1 4.8	10 16.1
COLUMN TOTAL	15 24.2	14 22.6	33 53.2	62 100.0

FILE ATCNAV13 (CREATION CATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR071 POWER UNIT,S REPLACED WITH REASON BY VAR065 RATED BATTERY DISCHARGE TIME
* PAGE 1 OF 2

VAR071 (COUNT / ROW PCT / COL PCT / TOT PCT) \ VARC69	1054.	1066.	1083.	1298.	2025.	2152.	2163.	2197.	2210.	2250.	ROW TOTAL
422. ENVRNMTL HAZARDS	0 0.0 0.0 0.0	1 3.2 33.3 1.9	0 0.0 0.0 0.0	1 3.2 33.3 1.9	1 3.2 33.3 1.9	20 64.5 74.1 37.7	1 3.2 100.0 1.9	2 6.5 50.0 3.8	1 3.2 100.0 1.9	0 0.0 0.0 0.0	31 58.5
424. PERSONNEL ERRORS	1 7.1 100.0 1.9	2 14.3 66.7 3.8	1 7.1 100.0 1.9	1 7.1 33.3 1.9	2 14.3 66.7 3.8	3 21.4 11.1 5.7	0 0.0 0.0 0.0	1 7.1 25.0 1.9	0 0.0 0.0 0.0	0 0.0 0.0 0.0	14 26.4
427. MANUFCTRG ERRORS	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 12.5 33.3 1.9	0 0.0 0.0 0.0	4 50.0 14.8 7.5	0 0.0 0.0 0.0	1 12.5 25.0 1.9	0 0.0 0.0 0.0	1 12.5 100.0 1.9	8 15.1
COLUMN TOTAL	1 1.9	3 5.7	1 1.9	3 5.7	3 5.7	27 50.9	1 1.9	4 7.5	1 1.9	1 1.9	53 100.0

(CONTINUED)

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

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VAR071 POWER UNIT,S REPLACED WITH REASON BY VAR069 RATED BATTERY DISCHARGE TIME

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VAR071	COUNT / ROW PCT / COL PCT / TOT PCT	VAR069 2330.	3000.	ROW TOTAL
ENVRNMTL HAZARDS	422.	1 3.2 100.0 1.9	3 9.7 42.9 5.7	31 58.5
PERSONNEL ERRORS	424.	0 0.0 0.0 0.0	3 21.4 42.9 5.7	14 26.4
MANUFCTRG ERRORS	427.	0 0.0 0.0 0.0	1 12.5 14.3 1.9	8 15.1
COLUMN TOTAL		1 1.9	7 13.2	53 100.0

NUMBER OF MISSING OBSERVATIONS = 9

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VARPER PERCENT EXPECTED BATTERY LIFE USED

CODE	3.00	4.00	6.00	7.00	9.00
ABSOLUTE FREQUENCY	2	1	2	3	1
RELATIVE FREQUENCY (PERCENT)	2.1	1.0	2.1	3.1	1.0
CUMULATIVE FREQUENCY (PERCENT)	2.1	3.1	5.2	8.3	9.4
CODE	11.00	16.00	19.00	22.00	24.00
ABSOLUTE FREQUENCY	3	1	1	1	2
RELATIVE FREQUENCY (PERCENT)	3.1	1.0	1.0	1.0	2.1
CUMULATIVE FREQUENCY (PERCENT)	12.5	13.5	14.6	15.6	17.7
CODE	25.00	27.00	29.00	31.00	32.00
ABSOLUTE FREQUENCY	2	1	3	1	2
RELATIVE FREQUENCY (PERCENT)	2.1	1.0	3.1	1.0	2.1
CUMULATIVE FREQUENCY (PERCENT)	19.8	20.8	24.0	25.0	27.1
CODE	33.00	34.00	35.00	36.00	41.00
ABSOLUTE FREQUENCY	1	2	1	1	1
RELATIVE FREQUENCY (PERCENT)	1.0	2.1	1.0	1.0	1.0
CUMULATIVE FREQUENCY (PERCENT)	28.1	30.2	31.2	32.3	33.3
CODE	42.00	43.00	47.00	51.00	52.00
ABSOLUTE FREQUENCY	1	1	2	1	1
RELATIVE FREQUENCY (PERCENT)	1.0	1.0	2.1	1.0	1.0
CUMULATIVE FREQUENCY (PERCENT)	34.4	35.4	37.5	38.5	39.6
CODE	58.00	59.00	64.00	65.00	67.00
ABSOLUTE FREQUENCY	2	1	2	2	1
RELATIVE FREQUENCY (PERCENT)	2.1	1.0	2.1	2.1	1.0
CUMULATIVE FREQUENCY (PERCENT)	41.7	42.7	44.8	46.9	47.9
CODE	68.00	72.00	73.00	75.00	77.00
ABSOLUTE FREQUENCY	1	1	2	1	2
RELATIVE FREQUENCY (PERCENT)	1.0	1.0	2.1	1.0	2.1
CUMULATIVE FREQUENCY (PERCENT)	49.0	50.0	52.1	53.1	55.2

CODE	79.00	82.00	83.00	84.00	85.00
ABSOLUTE FREQUENCY	2	1	3	1	1
RELATIVE FREQUENCY (PERCENT)	2.1	1.0	3.1	1.0	1.0
CUMULATIVE FREQUENCY (PERCENT)	57.3	58.3	61.5	62.5	63.5
CODE	86.00	87.00	88.00	89.00	91.00
ABSOLUTE FREQUENCY	2	2	1	2	3
RELATIVE FREQUENCY (PERCENT)	2.1	2.1	1.0	2.1	3.1
CUMULATIVE FREQUENCY (PERCENT)	65.6	67.7	68.7	70.8	74.0
CODE	92.00	94.00	95.00	96.00	98.00
ABSOLUTE FREQUENCY	1	4	1	1	1
RELATIVE FREQUENCY (PERCENT)	1.0	4.2	1.0	1.0	1.0
CUMULATIVE FREQUENCY (PERCENT)	75.0	79.2	80.2	81.2	82.3
CODE	100.00	101.00	103.00	105.00	107.00
ABSOLUTE FREQUENCY	5	1	1	1	1
RELATIVE FREQUENCY (PERCENT)	5.2	1.0	1.0	1.0	1.0
CUMULATIVE FREQUENCY (PERCENT)	87.5	88.5	89.6	90.6	91.7
CODE	108.00	110.00	111.00	113.00	115.00
ABSOLUTE FREQUENCY	1	2	1	1	1
RELATIVE FREQUENCY (PERCENT)	1.0	2.1	1.0	1.0	1.0
CUMULATIVE FREQUENCY (PERCENT)	92.7	94.8	95.8	96.9	97.9
CODE	121.00	164.00			
ABSOLUTE FREQUENCY	1	1			
RELATIVE FREQUENCY (PERCENT)	1.0	1.0			
CUMULATIVE FREQUENCY (PERCENT)	99.0	100.0			

MISSING VALUES..

CODE	0.0
ABSOLUTE FREQUENCY	172

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

CESIRED STATISTICS..

MEAN	63.823	STD ERROR	3.670	MEDIAN	72.500
MODE	100.000	STD DEV	35.955	VARIANCE	1292.758
KURTOSIS	-0.864	SKEWNESS	-0.089	RANGE	161.000
MINIMUM	3.000	MAXIMUM	164.000		

VALID CBSERVATIONS - 96
MISSING CBSERVATIONS - 172 OR 64.2 PERCENT OF TOTAL

CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING 01/15/75 PAGE 33

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

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VAR003 LOCATION BY VARPER PERCENT EXPECTED BATTERY LIFE USED

* PAGE 1 OF 1

VAR003 (VARPER →) COUNT / ROW PCT / COL PCT / TOT PCT	10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
U PROTECTED RIVER	2	3	2	3	3	7	6	2	1	1	30
	6.7	10.0	6.7	10.0	10.0	23.3	20.0	6.7	3.3	3.3	31.3
	14.3	17.6	20.0	50.0	37.5	53.8	37.5	28.6	25.0	100.0	
	2.1	3.1	2.1	3.1	3.1	7.3	6.3	2.1	1.0	1.0	
T BAY,HARBCR PROTE	0	0	2	1	2	1	2	1	1	0	10
	0.0	0.0	20.0	10.0	20.0	10.0	20.0	10.0	10.0	0.0	10.4
	0.0	0.0	20.0	16.7	25.0	7.7	12.5	14.3	25.0	0.0	
	0.0	0.0	2.1	1.0	2.1	1.0	2.1	1.0	1.0	0.0	
M SEMI-EXPD RIVER	0	2	0	0	0	2	5	1	0	0	10
	0.0	20.0	0.0	0.0	0.0	20.0	50.0	10.0	0.0	0.0	10.4
	0.0	11.8	0.0	0.0	0.0	15.4	31.3	14.3	0.0	0.0	
	0.0	2.1	0.0	0.0	0.0	2.1	5.2	1.0	0.0	0.0	
L SEMI-EXPC BAY,HA	1	0	0	0	0	1	1	0	0	0	3
	33.3	0.0	0.0	0.0	0.0	33.3	33.3	0.0	0.0	0.0	3.1
	7.1	0.0	0.0	0.0	0.0	7.7	6.3	0.0	0.0	0.0	
	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	
D EXPOSED RIVER	2	0	0	0	1	1	0	1	0	0	5
	40.0	0.0	0.0	0.0	20.0	20.0	0.0	20.0	0.0	0.0	5.2
	14.3	0.0	0.0	0.0	12.5	7.7	0.0	14.3	0.0	0.0	
	2.1	0.0	0.0	0.0	1.0	1.0	0.0	1.0	0.0	0.0	
C EXPOSED BAY,HARB	0	0	0	0	0	0	0	1	0	0	1
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	1.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3	0.0	0.0	
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	
B EXPOSED SEA COAS	9	12	6	2	2	1	2	1	2	0	37
	24.3	32.4	16.2	5.4	5.4	2.7	5.4	2.7	5.4	0.0	38.5
	64.3	70.6	60.0	33.3	25.0	7.7	12.5	14.3	50.0	0.0	
	9.4	12.5	6.3	2.1	2.1	1.0	2.1	1.0	2.1	0.0	
COLUMN TOTAL	14	17	10	6	8	13	16	7	4	1	96
	14.6	17.7	10.4	6.3	8.3	13.5	16.7	7.3	4.2	1.0	100.0

NUMBER OF MISSING OBSERVATIONS = 172

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR004 BUOY SIZE BY VARPER PERCENT EXPECTED BATTERY LIFE USED
* PAGE 1 OF 2

VAR004	VARPER COUNT ROW PCT COL PCT TOT PCT	10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
10 X 39	39.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 16.7 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
5 X 10	510.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 16.7 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
6 X 20	620.	1 11.1 7.1 1.0	1 11.1 5.9 1.0	0 0.0 0.0 0.0	2 22.2 33.3 2.1	0 0.0 0.0 0.0	3 33.3 23.1 3.1	0 0.0 0.0 0.0	1 11.1 14.3 1.0	1 11.1 25.0 1.0	0 0.0 0.0 0.0	9 9.4
7 X 15	715.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 8.3 10.0 1.0	1 8.3 16.7 1.0	2 16.7 25.0 2.1	3 25.0 23.1 3.1	2 16.7 12.5 2.1	1 8.3 14.3 1.0	1 8.3 25.0 1.0	1 8.3 100.0 1.0	12 12.5
7 X 17	717.	0 0.0 0.0 0.0	2 20.0 11.8 2.1	1 10.0 10.0 1.0	0 0.0 0.0 0.0	2 20.0 25.0 2.1	2 20.0 15.4 2.1	2 20.0 12.5 2.1	1 10.0 14.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	10 10.4
8 X 20	820.	0 0.0 0.0 0.0	1 50.0 5.9 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 50.0 6.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 2.1
8 X 23	823.	1 25.0 7.1 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 25.0 7.7 1.0	0 0.0 0.0 0.0	2 50.0 28.6 2.1	0 0.0 0.0 0.0	0 0.0 0.0 0.0	4 4.2
	COLUMN TOTAL	14 14.6	17 17.7	10 10.4	6 6.3	8 8.3	13 13.5	16 16.7	7 7.3	4 4.2	1 1.0	96 100.0

(CONTINUED)

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * * *

VAR004 BUOY SIZE BY VARPER PERCENT EXPECTED BATTERY LIFE USED

* PAGE 2 OF 2

VAR004	VARPER: COUNT / ROW PCT / COL PCT / TOT PCT	10.00	30.00	50.00	55.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
8 X 26	826.	10	12	3	0	4	2	9	1	0	0	41
		24.4	29.3	7.3	0.0	9.8	4.9	22.0	2.4	0.0	0.0	42.7
		71.4	70.6	30.0	0.0	50.0	15.4	56.3	14.3	0.0	0.0	
		10.4	12.5	3.1	0.0	4.2	2.1	9.4	1.0	0.0	0.0	
9 X 32	932.	1	0	2	1	0	1	1	0	2	0	8
		12.5	0.0	25.0	12.5	0.0	12.5	12.5	0.0	25.0	0.0	8.3
		7.1	0.0	20.0	16.7	0.0	7.7	6.3	0.0	50.0	0.0	
		1.0	0.0	2.1	1.0	0.0	1.0	1.0	0.0	2.1	0.0	
9 X 34	934.	0	0	1	0	0	0	0	0	0	0	1
		0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
		0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
		0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
9 X 38	938.	1	1	2	0	0	1	1	1	0	0	7
		14.3	14.3	28.6	0.0	0.0	14.3	14.3	14.3	0.0	0.0	7.3
		7.1	5.9	20.0	0.0	0.0	7.7	6.3	14.3	0.0	0.0	
		1.0	1.0	2.1	0.0	0.0	1.0	1.0	1.0	0.0	0.0	
	COLUMN TOTAL	14	17	10	6	8	13	16	7	4	1	96
		14.6	17.7	10.4	6.3	8.3	13.5	16.7	7.3	4.2	1.0	100.0

NUMBER OF MISSING OBSERVATIONS = 172

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

C R O S S T A B U L A T I O N O F VAR006 VENT VALVES PER POCKET BY VARPER PERCENT EXPECTED BATTERY LIFE USED

PAGE 1 OF 1

VAR006	COUNT / ROW PCT / COL PCT / TOT PCT	VARPER 10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
1,BALL INSTALLED	1.	13 16.0 92.9 13.5	16 19.8 94.1 16.7	10 12.3 100.0 10.4	5 6.2 83.3 5.2	6 7.4 75.0 6.3	11 13.6 84.6 11.5	11 13.6 68.8 11.5	5 6.2 71.4 5.2	3 3.7 75.0 3.1	1 1.2 100.0 1.0	81 84.4
2,BALLS INSTLD	2.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 16.7 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
1 VENT ,NO BALLS	3.	1 7.7 7.1 1.0	1 7.7 5.9 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 15.4 25.0 2.1	2 15.4 15.4 2.1	5 38.5 31.3 5.2	1 7.7 14.3 1.0	1 7.7 25.0 1.0	0 0.0 0.0 0.0	13 13.5
2 VENTS,NO BALLS	4.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 14.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
	COLUMN TOTAL	14 14.6	17 17.7	10 10.4	6 6.3	8 8.3	13 13.5	16 16.7	7 7.3	4 4.2	1 1.0	96 100.0

NUMBER OF MISSING OBSERVATIONS = 172

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * * *
VAR007 LIGHT CHARACTERISTIC BY VARPER PERCENT EXPECTED BATTERY LIFE USED
* PAGE 1 OF 1

VAR007	COUNT / ROW PCT / COL PCT / TOT PCT	VARPER 10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
CK FL 0.3	103.	1	1	5	1	1	2	1	4	1	1	18
		5.6	5.6	27.8	5.6	5.6	11.1	5.6	22.2	5.6	5.6	18.8
		7.1	5.9	50.0	16.7	12.5	15.4	6.3	57.1	25.0	100.0	
		1.0	1.0	5.2	1.0	1.0	2.1	1.0	4.2	1.0	1.0	
MO A.4FL.6EC,2.0	145.	0	0	0	1	0	0	0	0	0	0	1
		0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
		0.0	0.0	0.0	16.7	0.0	0.0	0.0	0.0	0.0	0.0	
		0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	
FL 2.5 .5**	255.	0	0	0	0	1	0	0	0	0	0	1
		0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	1.0
		0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	
		0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	
FL 4 .4	404.	13	16	5	4	6	11	15	3	3	0	76
		17.1	21.1	6.6	5.3	7.9	14.5	19.7	3.9	3.9	0.0	79.2
		92.9	94.1	50.0	66.7	75.0	84.6	93.8	42.9	75.0	0.0	
		13.5	16.7	5.2	4.2	6.3	11.5	15.6	3.1	3.1	0.0	
	COLUMN TOTAL	14	17	10	6	8	13	16	7	4	1	96
		14.6	17.7	10.4	6.3	8.3	13.5	16.7	7.3	4.2	1.0	100.0

NUMBER OF MISSING OBSERVATIONS = 172

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR012 POWER SOURCE-BATTERY BY VARPER PERCENT EXPECTED BATTERY LIFE USED
* PAGE 1 OF 2

VAR012	COUNT / ROW PCT / COL PCT / TOT PCT	VARPER 10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
6000 60S1 A-H,2 EDSN	COUNT	1	0	0	0	0	0	0	0	0	0	1
	ROW PCT	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
	COL PCT	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	TOT PCT	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
6000 60E2 A-H,2EDSN#2	COUNT	0	1	3	0	0	0	0	0	0	0	4
	ROW PCT	0.0	25.0	75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2
	COL PCT	0.0	5.9	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	TOT PCT	0.0	1.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
5000 50BY A-H,EDISON-C	COUNT	0	0	2	1	0	0	1	1	0	0	5
	ROW PCT	0.0	0.0	40.0	20.0	0.0	0.0	20.0	20.0	0.0	0.0	5.2
	COL PCT	0.0	0.0	20.0	16.7	0.0	0.0	6.3	14.3	0.0	0.0	
	TOT PCT	0.0	0.0	2.1	1.0	0.0	0.0	1.0	1.0	0.0	0.0	
3000 30E2 A-H,EDISON#	COUNT	0	1	0	1	0	0	1	0	0	0	3
	ROW PCT	0.0	33.3	0.0	33.3	0.0	0.0	33.3	0.0	0.0	0.0	3.1
	COL PCT	0.0	5.9	0.0	16.7	0.0	0.0	6.3	0.0	0.0	0.0	
	TOT PCT	0.0	1.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	
2500 25BY A-H,EDISON-	COUNT	0	0	1	0	3	3	7	1	0	0	15
	ROW PCT	0.0	0.0	6.7	0.0	20.0	20.0	46.7	6.7	0.0	0.0	15.6
	COL PCT	0.0	0.0	10.0	0.0	37.5	23.1	43.8	14.3	0.0	0.0	
	TOT PCT	0.0	0.0	1.0	0.0	3.1	3.1	7.3	1.0	0.0	0.0	
2000 20S1 A-H,2 EDSN	COUNT	0	1	0	0	0	0	0	0	0	0	1
	ROW PCT	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
	COL PCT	0.0	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	TOT PCT	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1000 20JS A-H,2EDISON	COUNT	0	0	1	1	1	0	2	0	1	0	6
	ROW PCT	0.0	0.0	16.7	16.7	16.7	0.0	33.3	0.0	16.7	0.0	6.3
	COL PCT	0.0	0.0	10.0	16.7	12.5	0.0	12.5	0.0	25.0	0.0	
	TOT PCT	0.0	0.0	1.0	1.0	1.0	0.0	2.1	0.0	1.0	0.0	
COLUMN TOTAL		14	17	10	6	8	13	16	7	4	1	96
		14.6	17.7	10.4	6.3	8.3	13.5	16.7	7.3	4.2	1.0	100.0

(CONTINUED)

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR012 POWER SOURCE-BATTERY BY VARPER PERCENT EXPECTED BATTERY LIFE USED
PAGE 2 OF 2

VAR012	COUNT / ROW PCT / COL PCT / TOT PCT	VARPER 10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
20E2 2000 A-H,2EDISON	COUNT	10	12	2	2	2	9	1	3	1	1	43
	ROW PCT	23.3	27.9	4.7	4.7	4.7	20.9	2.3	7.0	2.3	2.3	44.8
	COL PCT	71.4	70.6	20.0	33.3	25.0	69.2	6.3	42.9	25.0	100.0	
	TOT PCT	10.4	12.5	2.1	2.1	2.1	9.4	1.0	3.1	1.0	1.0	
10JS 1000 A-H,EDISONJ	COUNT	0	0	1	0	0	0	1	0	0	0	2
	ROW PCT	0.0	0.0	50.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	2.1
	COL PCT	0.0	0.0	10.0	0.0	0.0	0.0	6.3	0.0	0.0	0.0	
	TOT PCT	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	
10E2 1000 A-H,EDISON#	COUNT	3	2	0	1	2	1	3	2	2	0	16
	ROW PCT	18.8	12.5	0.0	6.3	12.5	6.3	18.8	12.5	12.5	0.0	16.7
	COL PCT	21.4	11.8	0.0	16.7	25.0	7.7	18.8	28.6	50.0	0.0	
	TOT PCT	3.1	2.1	0.0	1.0	2.1	1.0	3.1	2.1	2.1	0.0	
COLUMN TOTAL		14	17	10	6	8	13	16	7	4	1	96
		14.6	17.7	10.4	6.3	8.3	13.5	16.7	7.3	4.2	1.0	100.0

NUMBER OF MISSING OBSERVATIONS = 172

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

C R O S S T A B U L A T I O N O F VAR014 LAMPCHANGER BY VARPER PERCENT EXPECTED BATTERY LIFE USED

PAGE 1 OF 1

VAR014 (COUNT / ROW PCT / COL PCT / TOT PCT)	VARPER 10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
65. 6 LAMP,CG6P CRDC	4 22.2 28.6 4.2	7 38.9 41.2 7.3	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	5 27.8 38.5 5.2	1 5.6 6.3 1.0	0 0.0 0.0 0.0	1 5.6 25.0 1.0	0 0.0 0.0 0.0	18 18.8
97. 4 LAMP,FU-1297	10 12.8 71.4 10.4	10 12.8 58.8 10.4	10 12.8 100.0 10.4	6 7.7 100.0 6.3	8 10.3 100.0 8.3	8 10.3 61.5 8.3	15 19.2 93.8 15.6	7 9.0 100.0 7.3	3 3.8 75.0 3.1	1 1.3 100.0 1.0	78 81.3
COLUMN TOTAL	14 14.6	17 17.7	10 10.4	6 6.3	8 8.3	13 13.5	16 16.7	7 7.3	4 4.2	1 1.0	96 100.0

NUMBER OF MISSING OBSERVATIONS = 172

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FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR015 FLASHER BY VARPER PERCENT EXPECTED BATTERY LIFE USED
* PAGE 1 OF 1

VAR015 / VARPER COUNT ROW PCT COL PCT TOT PCT	10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
65. C-R S-1065 SS	3 12.0 21.4 3.1	1 4.0 5.9 1.0	1 4.0 10.0 1.0	2 8.0 33.3 2.1	4 16.0 50.0 4.2	5 20.0 38.5 5.2	5 20.0 31.3 5.2	3 12.0 42.9 3.1	1 4.0 25.0 1.0	0 0.0 0.0 0.0	25 26.0
81. CG-181 C-R DEV.	11 16.2 78.6 11.5	16 23.5 94.1 16.7	8 11.8 80.0 8.3	4 5.9 66.7 4.2	2 2.9 25.0 2.1	8 11.8 61.5 8.3	11 16.2 68.8 11.5	4 5.9 57.1 4.2	3 4.4 75.0 3.1	1 1.5 100.0 1.0	68 70.8
83. VAPAIR	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 33.3 10.0 1.0	0 0.0 0.0 0.0	2 66.7 25.0 2.1	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	3 3.1
COLUMN TOTAL	14 14.6	17 17.7	10 10.4	6 6.3	8 8.3	13 13.5	16 16.7	7 7.3	4 4.2	1 1.0	96 100.0

NUMBER OF MISSING OBSERVATIONS = 172

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * * *
VAR016 SOUND SIGNAL BY VARPER PERCENT EXPECTED BATTERY LIFE USED
* PAGE 1 OF 1

VAR016 / COUNT ROW PCT COL PCT TOT PCT	VARPER 10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
0. NO SOUND SIGNAL	6 10.5 42.9 6.3	7 12.3 41.2 7.3	5 8.8 50.0 5.2	4 7.0 66.7 4.2	6 10.5 75.0 6.3	10 17.5 76.9 10.4	12 21.1 75.0 12.5	4 7.0 57.1 4.2	2 3.5 50.0 2.1	1 1.8 100.0 1.0	57 59.4
79. WHISTLE 4 BALL	2 16.7 14.3 2.1	1 8.3 5.9 1.0	3 25.0 30.0 3.1	1 8.3 16.7 1.0	0 0.0 0.0 0.0	2 16.7 15.4 2.1	1 8.3 6.3 1.0	1 8.3 14.3 1.0	1 8.3 25.0 1.0	0 0.0 0.0 0.0	12 12.5
81. BELL PRE 1952 TP	1 16.7 7.1 1.0	0 0.0 0.0 0.0	1 16.7 10.0 1.0	1 16.7 16.7 1.0	0 0.0 0.0 0.0	1 16.7 7.7 1.0	1 16.7 6.3 1.0	0 0.0 0.0 0.0	1 16.7 25.0 1.0	0 0.0 0.0 0.0	6 6.3
82. BELL1952 TAPPER	1 20.0 7.1 1.0	3 60.0 17.6 3.1	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 20.0 14.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	5 5.2
83. BELL1962 TAPPER	0 0.0 0.0 0.0	2 25.0 11.8 2.1	1 12.5 10.0 1.0	0 0.0 0.0 0.0	2 25.0 25.0 2.1	0 0.0 0.0 0.0	2 25.0 12.5 2.1	1 12.5 14.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	8 8.3
85. GONG1952 TAPPER	0 0.0 0.0 0.0	1 100.0 5.9 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
86. GONG1962 TAPPER	4 57.1 28.6 4.2	3 42.9 17.6 3.1	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	7 7.3
COLUMN TOTAL	14 14.6	17 17.7	10 10.4	6 6.3	8 8.3	13 13.5	16 16.7	7 7.3	4 4.2	1 1.0	96 100.0

NUMBER OF MISSING OBSERVATIONS = 172

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR017 DAYLIGHT CONTROL BY VARPER PERCENT EXPECTED BATTERY LIFE USED
* PAGE 1 OF 1

VAR017	COUNT / ROW PCT / COL PCT / TOT PCT	10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
CR-S1065-LS1	11.	0	0	0	0	1	1	0	0	0	0	2
		0.0	0.0	0.0	0.0	50.0	50.0	0.0	0.0	0.0	0.0	2.1
		0.0	0.0	0.0	0.0	12.5	7.7	0.0	0.0	0.0	0.0	
		0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	
CR-S1065-LS MNTD	13.	0	2	0	0	0	0	1	0	0	0	3
		0.0	66.7	0.0	0.0	0.0	0.0	33.3	0.0	0.0	0.0	3.1
		0.0	11.8	0.0	0.0	0.0	0.0	6.3	0.0	0.0	0.0	
		0.0	2.1	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	
C-CLEAR-ALL	31.	5	6	3	5	3	4	6	4	2	0	38
		13.2	15.8	7.9	13.2	7.9	10.5	15.8	10.5	5.3	0.0	39.6
		35.7	35.3	30.0	83.3	37.5	30.8	37.5	57.1	50.0	0.0	
		5.2	6.3	3.1	5.2	3.1	4.2	6.3	4.2	2.1	0.0	
R-COLOR PLASTIC	32.	6	7	3	0	2	6	7	2	2	1	36
		16.7	19.4	8.3	0.0	5.6	16.7	19.4	5.6	5.6	2.8	37.5
		42.9	41.2	30.0	0.0	25.0	46.2	43.8	28.6	50.0	100.0	
		6.3	7.3	3.1	0.0	2.1	6.3	7.3	2.1	2.1	1.0	
B-COLOR GLASS	33.	3	2	4	1	2	2	2	1	0	0	17
		17.6	11.8	23.5	5.9	11.8	11.8	11.8	5.9	0.0	0.0	17.7
		21.4	11.8	40.0	16.7	25.0	15.4	12.5	14.3	0.0	0.0	
		3.1	2.1	4.2	1.0	2.1	2.1	2.1	1.0	0.0	0.0	
	COLUMN TOTAL	14	17	10	6	8	13	16	7	4	1	96
		14.6	17.7	10.4	6.3	8.3	13.5	16.7	7.3	4.2	1.0	100.0

NUMBER OF MISSING OBSERVATIONS = 172

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR018 BOTTOM DESCRIPTION BY VARPER PERCENT EXPECTED BATTERY LIFE USED
* PAGE 1 OF 1

VAR018	COUNT ROW PCT COL PCT TOT PCT	VARPER 10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
SAND S		12 22.2 85.7 12.5	14 25.9 82.4 14.6	5 9.3 50.0 5.2	2 3.7 33.3 2.1	3 5.6 37.5 3.1	4 7.4 30.8 4.2	11 20.4 68.8 11.5	2 3.7 28.6 2.1	1 1.9 25.0 1.0	0 0.0 0.0 0.0	54 56.3
ROCK R		1 14.3 7.1 1.0	0 0.0 0.0 0.0	3 42.9 30.0 3.1	1 14.3 16.7 1.0	0 0.0 0.0 0.0	2 28.6 15.4 2.1	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	7 7.3
MUD M		1 3.6 7.1 1.0	3 10.7 17.6 3.1	1 3.6 10.0 1.0	3 10.7 50.0 3.1	3 10.7 37.5 3.1	7 25.0 53.8 7.3	5 17.9 31.3 5.2	3 10.7 42.9 3.1	1 3.6 25.0 1.0	1 3.6 100.0 1.0	28 29.2
GRAVEL G		0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 14.3 10.0 1.0	0 0.0 0.0 0.0	2 28.6 25.0 2.1	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 28.6 28.6 2.1	2 28.6 50.0 2.1	0 0.0 0.0 0.0	7 7.3
	COLUMN TOTAL	14 14.6	17 17.7	10 10.4	6 6.3	8 8.3	13 13.5	16 16.7	7 7.3	4 4.2	1 1.0	96 100.0

NUMBER OF MISSING OBSERVATIONS = 172

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * * *
VAR021 BRIDLE SIZE BY VARPER PERCENT EXPECTED BATTERY LIFE USED
* PAGE 1 OF 1

VAR021	COUNT ROW PCT COL PCT TOT PCT	VARPER 10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
1" X12'	2.	1 14.3 7.1 1.0	1 14.3 5.9 1.0	0 0.0 0.0 0.0	2 28.6 33.3 2.1	0 0.0 0.0 0.0	2 28.6 15.4 2.1	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 14.3 25.0 1.0	0 0.0 0.0 0.0	7 7.3
1" X 15'	3.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 50.0 10.0 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 50.0 6.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 2.1
1 1-4" X 15'	4.	11 15.7 78.6 11.5	15 21.4 88.2 15.6	4 5.7 40.0 4.2	2 2.9 33.3 2.1	8 11.4 100.0 8.3	9 12.9 69.2 9.4	13 18.6 81.3 13.5	6 8.6 85.7 6.3	1 1.4 25.0 1.0	1 1.4 100.0 1.0	70 72.9
1 1-2" X 18'	6.	1 11.1 7.1 1.0	0 0.0 0.0 0.0	3 33.3 30.0 3.1	1 11.1 16.7 1.0	0 0.0 0.0 0.0	1 11.1 7.7 1.0	1 11.1 6.3 1.0	0 0.0 0.0 0.0	2 22.2 50.0 2.1	0 0.0 0.0 0.0	9 9.4
1 1-2" X 26'	7.	1 12.5 7.1 1.0	1 12.5 5.9 1.0	2 25.0 20.0 2.1	1 12.5 16.7 1.0	0 0.0 0.0 0.0	1 12.5 7.7 1.0	1 12.5 6.3 1.0	1 12.5 14.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	8 8.3
	COLUMN TOTAL	14 14.6	17 17.7	10 10.4	6 6.3	8 8.3	13 13.5	16 16.7	7 7.3	4 4.2	1 1.0	96 100.0

NUMBER OF MISSING OBSERVATIONS = 172

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
VAR022 SWIVEL SIZE AND NUMBER BY VARPER PERCENT EXPECTED BATTERY LIFE USED
* PAGE 1 OF 1

VAR022 (COUNT / ROW PCT / COL PCT / TOT PCT)	VARPER 10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
2. 1 1-2" 3RD CLASS	1 8.3 7.1 1.0	3 25.0 17.6 3.1	1 8.3 10.0 1.0	2 16.7 33.3 2.1	0 0.0 0.0 0.0	2 16.7 15.4 2.1	2 16.7 12.5 2.1	0 0.0 0.0 0.0	1 8.3 25.0 1.0	0 0.0 0.0 0.0	12 12.5
3. 1 3-4" 2ND CLASS	11 16.2 78.6 11.5	13 19.1 76.5 13.5	4 5.9 40.0 4.2	2 2.9 33.3 2.1	8 11.8 100.0 8.3	9 13.2 69.2 9.4	12 17.6 75.0 12.5	6 8.8 85.7 6.3	2 2.9 50.0 2.1	1 1.5 100.0 1.0	68 70.8
4. 2" 1ST CLASS	2 12.5 14.3 2.1	1 6.3 5.9 1.0	5 31.3 50.0 5.2	2 12.5 33.3 2.1	0 0.0 0.0 0.0	2 12.5 15.4 2.1	2 12.5 12.5 2.1	1 6.3 14.3 1.0	1 6.3 25.0 1.0	0 0.0 0.0 0.0	16 16.7
COLUMN TOTAL	14 14.6	17 17.7	10 10.4	6 6.3	8 8.3	13 13.5	16 16.7	7 7.3	4 4.2	1 1.0	96 100.0

NUMBER OF MISSING OBSERVATIONS = 172

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FILE ATCNAV13 (CREATION DATE = 01/15/75)   100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * C R O S S T A B U L A T I O N   O F * * * * * * * * *
VAR023 FIRST CHAIN SIZE BY VARPER PERCENT EXPECTED BATTERY LIFE USED
PAGE 1 OF 1

VAR023	COUNT / ROW PCT / COL PCT / TOT PCT	VARPER 10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
1 1-4"	6.	1	3	2	4	2	8	5	2	1	1	29
		3.4	10.3	6.9	13.8	6.9	27.6	17.2	6.9	3.4	3.4	30.2
		7.1	17.6	20.0	66.7	25.0	61.5	31.3	28.6	25.0	100.0	
		1.0	3.1	2.1	4.2	2.1	8.3	5.2	2.1	1.0	1.0	
1 1-2"	7.	3	3	0	1	4	2	9	2	2	0	26
		11.5	11.5	0.0	3.8	15.4	7.7	34.6	7.7	7.7	0.0	27.1
		21.4	17.6	0.0	16.7	50.0	15.4	56.3	28.6	50.0	0.0	
		3.1	3.1	0.0	1.0	4.2	2.1	9.4	2.1	2.1	0.0	
1 5-8"AND LARGER	8.	10	11	8	1	2	3	2	3	1	0	41
		24.4	26.8	19.5	2.4	4.9	7.3	4.9	7.3	2.4	0.0	42.7
		71.4	64.7	80.0	16.7	25.0	23.1	12.5	42.9	25.0	0.0	
		10.4	11.5	8.3	1.0	2.1	3.1	2.1	3.1	1.0	0.0	
	COLUMN TOTAL	14	17	10	6	8	13	16	7	4	1	96
		14.6	17.7	10.4	6.3	8.3	13.5	16.7	7.3	4.2	1.0	100.0

NUMBER OF MISSING OBSERVATIONS = 172

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * * *
VAR069 RATED BATTERY DISCHARGE TIME BY VARPER PERCENT EXPECTED BATTERY LIFE USED
* PAGE 1 OF 2

VAR069	VARPER COUNT ROW PCT COL PCT TOT PCT	10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
	1054.	1 16.7 7.1 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 16.7 12.5 1.0	0 0.0 0.0 0.0	1 16.7 6.3 1.0	2 33.3 28.6 2.1	1 16.7 25.0 1.0	0 0.0 0.0 0.0	6 6.3
	1061.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 16.7 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
	1066.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 14.3 12.5 1.0	2 28.6 15.4 2.1	0 0.0 0.0 0.0	2 28.6 28.6 2.1	1 14.3 25.0 1.0	1 14.3 100.0 1.0	7 7.3
	1083.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 12.5 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
	1298.	2 15.4 14.3 2.1	2 15.4 11.8 2.1	1 7.7 10.0 1.0	1 7.7 16.7 1.0	1 7.7 12.5 1.0	1 7.7 7.7 1.0	3 23.1 18.8 3.1	1 7.7 14.3 1.0	1 7.7 25.0 1.0	0 0.0 0.0 0.0	13 13.5
	2025.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	2 50.0 20.0 2.1	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 25.0 6.3 1.0	1 25.0 14.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	4 4.2
	2152.	9 27.3 64.3 9.4	13 39.4 76.5 13.5	3 9.1 30.0 3.1	1 3.0 16.7 1.0	1 3.0 12.5 1.0	3 9.1 23.1 3.1	2 6.1 12.5 2.1	0 0.0 0.0 0.0	1 3.0 25.0 1.0	0 0.0 0.0 0.0	33 34.4
	COLUMN TOTAL	14 14.6	17 17.7	10 10.4	6 6.3	8 8.3	13 13.5	16 16.7	7 7.3	4 4.2	1 1.0	96 100.0

(CONTINUED)

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR069 RATED BATTERY DISCHARGE TIME BY VARPER PERCENT EXPECTED BATTERY LIFE USED
* PAGE 2 OF 2

VAR069 (COUNT / ROW PCT / COL PCT / TOT PCT)	VARPER 10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
2163.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 16.7 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
2197.	1 20.0 7.1 1.0	1 20.0 5.9 1.0	3 60.0 30.0 3.1	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	5 5.2
2210.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 16.7 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
2250.	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 25.0 16.7 1.0	0 0.0 0.0 0.0	2 50.0 15.4 2.1	1 25.0 6.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	4 4.2
2330.	1 100.0 7.1 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 1.0
3000.	0 0.0 0.0 0.0	1 5.3 5.9 1.0	1 5.3 10.0 1.0	0 0.0 0.0 0.0	3 15.8 37.5 3.1	5 26.3 38.5 5.2	8 42.1 50.0 8.3	1 5.3 14.3 1.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	19 19.8
COLUMN TOTAL	14 14.6	17 17.7	10 10.4	6 6.3	8 8.3	13 13.5	16 16.7	7 7.3	4 4.2	1 1.0	96 100.0

NUMBER OF MISSING OBSERVATIONS = 172

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FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * *
VAR071 POWER UNIT,S REPLACED WITH REASON BY VARPER PERCENT EXPECTED BATTERY LIFE USED
PAGE 1 OF 1

VAR071	COUNT / ROW PCT / COL PCT / TOT PCT	VARPER 10.00	30.00	50.00	65.00	75.00	85.00	95.00	105.00	115.00	150.00	ROW TOTAL
421. ROUTINE SERVICIN	COUNT	0	0	3	0	2	5	13	6	3	0	32
	ROW PCT	0.0	0.0	9.4	0.0	6.3	15.6	40.6	18.8	9.4	0.0	35.2
	COL PCT	0.0	0.0	30.0	0.0	25.0	38.5	81.3	85.7	100.0	0.0	
	TOT PCT	0.0	0.0	3.3	0.0	2.2	5.5	14.3	6.6	3.3	0.0	
422. ENVRNMTL HAZARDS	COUNT	8	14	3	2	1	0	0	0	0	1	29
	ROW PCT	27.6	48.3	10.3	6.9	3.4	0.0	0.0	0.0	0.0	3.4	31.9
	COL PCT	66.7	87.5	30.0	40.0	12.5	0.0	0.0	0.0	0.0	100.0	
	TOT PCT	8.8	15.4	3.3	2.2	1.1	0.0	0.0	0.0	0.0	1.1	
423. TECH- ADMIN ERRO	COUNT	0	1	0	0	0	0	0	0	0	0	1
	ROW PCT	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1
	COL PCT	0.0	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	TOT PCT	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
424. PERSCNNEL ERRORS	COUNT	1	1	3	0	3	4	0	1	0	0	13
	ROW PCT	7.7	7.7	23.1	0.0	23.1	30.8	0.0	7.7	0.0	0.0	14.3
	COL PCT	8.3	6.3	30.0	0.0	37.5	30.8	0.0	14.3	0.0	0.0	
	TOT PCT	1.1	1.1	3.3	0.0	3.3	4.4	0.0	1.1	0.0	0.0	
426. CONVENIENCE-FOLL	COUNT	3	0	0	0	1	2	2	0	0	0	8
	ROW PCT	37.5	0.0	0.0	0.0	12.5	25.0	25.0	0.0	0.0	0.0	8.8
	COL PCT	25.0	0.0	0.0	0.0	12.5	15.4	12.5	0.0	0.0	0.0	
	TOT PCT	3.3	0.0	0.0	0.0	1.1	2.2	2.2	0.0	0.0	0.0	
427. MANUFCTRG ERRORS	COUNT	0	0	1	3	1	2	1	0	0	0	8
	ROW PCT	0.0	0.0	12.5	37.5	12.5	25.0	12.5	0.0	0.0	0.0	8.8
	COL PCT	0.0	0.0	10.0	60.0	12.5	15.4	6.3	0.0	0.0	0.0	
	TOT PCT	0.0	0.0	1.1	3.3	1.1	2.2	1.1	0.0	0.0	0.0	
COLUMN TOTAL		12	16	10	5	8	13	16	7	3	1	91
		13.2	17.6	11.0	5.5	8.8	14.3	17.6	7.7	3.3	1.1	100.0

NUMBER OF MISSING OBSERVATIONS = 177

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR073 FLASHER REPLACED WITH REASON

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
ROUTINE SERVICING	461.	4	4.3	4.3	4.3
ENVRNMTL HAZARDS	462.	40	42.6	42.6	46.8
PERSONNEL ERRORS	464.	19	20.2	20.2	67.0
CAUSED BY OTHR CMPNT	465.	2	2.1	2.1	69.1
CONVENIENCE-FOLLOWP	466.	17	18.1	18.1	87.2
MANUFCTRG ERRORS	467.	7	7.4	7.4	94.7
CORROSION	468.	4	4.3	4.3	98.9
PROJECTS-EXPERIMNTL	469.	1	1.1	1.1	100.0
	0.	0	0.0	MISSING	100.0
	TOTAL	94	100.0	100.0	100.0

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CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING                01/15/75        PAGE   53
FILE   ATCNAV13 (CREATION DATE = 01/15/75)   100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST
VARIABLE   VAR073     FLASHER REPLACED WITH REASON
      CODE
              I
      461.    ********* (      4)   4.3 PCT
              I    ROUTINE SERVICING
              I
              I
      462.    ********************************************************************************* (     40)  42.6 PCT
              I    ENVRNMTL HAZARDS
              I
              I
      464.    *************************************** (     19)  20.2 PCT
              I    PERSCNNEL ERRORS
              I
              I
      405.    ***** (      2)   2.1 PCT
              I    CAUSED BY OTHR CMPNT
              I
              I
      466.    *********************************** (     17)  18.1 PCT
              I    CONVENIENCE-FOLLOWP
              I
              I
      467.    *************** (      7)   7.4 PCT
              I    MANUFCTRG ERRORS
              I
              I
      468.    ********* (      4)   4.3 PCT
              I    CORROSION
              I
              I
      409.    *** (      1)   1.1 PCT
              I    PROJECTS-EXPERIMNTL
              I
              I
        0.    * (      0)   0.0 PCT
  (MISSING)   I
              I
              I.........I.........I.........I.........I.........I.........I.........I.........I.........I.........I
              0         5        10        15        20        25        30        35        40        45        50
              FREQUENCY

VALID   CBSERVATIONS -        94
MISSING CBSERVATIONS -         0
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FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * *
VAR073 FLASHER REPLACED WITH REASON BY VAR004 BUOY SIZE
* * * * * * * * PAGE 1 OF 2

VAR073 (COUNT / ROW PCT / COL PCT / TOT PCT)	VAR004: 10 X 39 (39.)	5 X 10 (510.)	6 X 20 (620.)	7 X 15 (715.)	7 X 17 (717.)	8 X 20 (820.)	8 X 23 (823.)	8 X 26 (826.)	9 X 32 (932.)	9 X 34 (934.)	ROW TOTAL
462. ENVRNMTL HAZARDS	0 0.0 0.0 0.0	0 0.0 0.0 0.0	7 17.5 87.5 10.6	3 7.5 60.0 4.5	1 2.5 33.3 1.5	1 2.5 100.0 1.5	1 2.5 50.0 1.5	22 55.0 78.6 33.3	2 5.0 25.0 3.0	0 0.0 0.0 0.0	40 60.6
464. PERSONNEL ERRORS	1 5.3 25.0 1.5	1 5.3 100.0 1.5	0 0.0 0.0 0.0	2 10.5 40.0 3.0	1 5.3 33.3 1.5	0 0.0 0.0 0.0	1 5.3 50.0 1.5	5 26.3 17.9 7.6	5 26.3 62.5 7.6	1 5.3 100.0 1.5	19 28.8
467. MANUFCTRG ERRORS	3 42.9 75.0 4.5	0 0.0 0.0 0.0	1 14.3 12.5 1.5	0 0.0 0.0 0.0	1 14.3 33.3 1.5	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 14.3 3.6 1.5	1 14.3 12.5 1.5	0 0.0 0.0 0.0	7 10.6
COLUMN TOTAL	4 6.1	1 1.5	8 12.1	5 7.6	3 4.5	1 1.5	2 3.0	28 42.4	8 12.1	1 1.5	66 100.0

(CONTINUED)

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

C R O S S T A B U L A T I O N O F VAR073 FLASHER REPLACED WITH REASON BY VAR004 BUOY SIZE

VAR073	COUNT / ROW PCT / COL PCT / TOT PCT	VAR004: 9 X 38 938.	ROW TOTAL
ENVRNMTL HAZARDS	462.	3 7.5 60.0 4.5	40 60.6
PERSCNNEL ERRORS	464.	2 10.5 40.0 3.0	19 28.8
MANUFCTRG ERRORS	467.	0 0.0 0.0 0.0	7 10.6
	COLUMN TOTAL	5 7.6	66 100.0

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * *
VAR073 FLASHER REPLACED WITH REASON BY VAR010 LANTERN-OPTIC
* * * * * * * * * PAGE 1 OF 1

VAR073	COUNT / ROW PCT / COL PCT / TOT PCT	VAR010: 155 MM ACRYLIC 16.	200 MM P.GLASS 20.	200 MM ALLOTHER 23.	ROW TOTAL
ENVRNMTL HAZARDS	462.	31	9	0	40
		77.5	22.5	0.0	60.6
		62.0	64.3	0.0	
		47.0	13.6	0.0	
PERSONNEL ERRORS	464.	12	5	2	19
		63.2	26.3	10.5	28.8
		24.0	35.7	100.0	
		18.2	7.6	3.0	
MANUFCTRG ERRORS	467.	7	0	0	7
		100.0	0.0	0.0	10.6
		14.0	0.0	0.0	
		10.6	0.0	0.0	
	COLUMN TOTAL	50	14	2	66
		75.8	21.2	3.0	100.0

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR073 FLASHER REPLACED WITH REASON BY VAR014 LAMPCHANGER
* PAGE 1 OF 1

VAR073	VAR014: COUNT / ROW PCT / COL PCT / TOT PCT	6 LAMP,C G6P CRCC 65.	4 LAMP,F U-1297 97.	ROW TOTAL
ENVRNMTL HAZARDS	462.	16 40.0 69.6 24.2	24 60.0 55.8 36.4	40 60.6
PERSONNEL ERRORS	464.	4 21.1 17.4 6.1	15 78.9 34.9 22.7	19 28.8
MANUFCTRG ERRORS	467.	3 42.9 13.0 4.5	4 57.1 9.3 6.1	7 10.6
COLUMN TOTAL		23 34.8	43 65.2	66 100.0

FILE ATCNAV13 (CREATION CATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

C R O S S T A B U L A T I O N O F VAR073 FLASHER REPLACED WITH REASON BY VAR015 FLASHER

VAR073	COUNT / ROW PCT / COL PCT / TOT PCT	VAR015: C-R S-10 65 SS 65.	CG-181 C-R DEV. 81.	VAPAIR 83.	ROW TOTAL
ENVRNMTL HAZARDS	462.	5	34	1	40
		12.5	85.0	2.5	60.6
		50.0	64.2	33.3	
		7.6	51.5	1.5	
PERSCNNEL ERRORS	464.	4	14	1	19
		21.1	73.7	5.3	28.8
		40.0	26.4	33.3	
		6.1	21.2	1.5	
MANUFCTRG ERRORS	467.	1	5	1	7
		14.3	71.4	14.3	10.6
		10.0	9.4	33.3	
		1.5	7.6	1.5	
	COLUMN TOTAL	10	53	3	66
		15.2	80.3	4.5	100.0

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * C R O S S T A B U L A T I O N O F * * * * * *

VAR073 FLASHER REPLACED WITH REASON BY VAR016 SOUND SIGNAL

VAR073 / VAR016 (COUNT, ROW PCT, COL PCT, TOT PCT)	NO SOUND SIGNAL 0.	WHISTLE 4 BALL 79.	BELL PRE 1952 TP 81.	BELL1952 TAPPER 82.	BELL1962 TAPPER 83.	GONG1952 TAPPER 85.	GONG1962 TAPPER 86.	ROW TOTAL
462. ENVRNMTL HAZARDS	22	6	1	4	1	1	5	40
	55.0	15.0	2.5	10.0	2.5	2.5	12.5	60.6
	64.7	35.3	33.3	80.0	100.0	100.0	100.0	
	33.3	9.1	1.5	6.1	1.5	1.5	7.6	
464. PERSONNEL ERRORS	9	7	2	1	0	0	0	19
	47.4	36.8	10.5	5.3	0.0	0.0	0.0	28.8
	26.5	41.2	66.7	20.0	0.0	0.0	0.0	
	13.6	10.6	3.0	1.5	0.0	0.0	0.0	
467. MANUFCTRG ERRORS	3	4	0	0	0	0	0	7
	42.9	57.1	0.0	0.0	0.0	0.0	0.0	10.6
	8.8	23.5	0.0	0.0	0.0	0.0	0.0	
	4.5	6.1	0.0	0.0	0.0	0.0	0.0	
COLUMN TOTAL	34	17	3	5	1	1	5	66
	51.5	25.8	4.5	7.6	1.5	1.5	7.6	100.0

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR074 LAMPCHANGER REPLACED WITH REASON

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
ROUTINE SERVICING	471.	4	4.4	4.4	4.4
ENVRNMTL HAZARDS	472.	40	44.0	44.0	48.4
PERSONNEL ERRORS	474.	19	20.9	20.9	69.2
CAUSED BY OTHR CMPNT	475.	2	2.2	2.2	71.4
CONVENIENCE-FOLLOWP	476.	16	17.6	17.6	89.0
MANUFCTRG ERRORS	477.	7	7.7	7.7	96.7
CORROSION	478.	2	2.2	2.2	98.9
PROJECTS-EXPERIMNTL	479.	1	1.1	1.1	100.0
	0.	0	0.0	MISSING	100.0
	TOTAL	91	100.0	100.0	100.0

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FILE     ATCNAV13 (CREATION DATE = 01/15/75)   100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST
VARIABLE   VAR074      LAMPCHANGER REPLACED WITH REASON
      CODE
             I
      471.   ********* (      4)   4.4 PCT
             I     ROUTINE SERVICING
             I
             I
      472.   ********************************************************************************* (     40)  44.0 PCT
             I     ENVRNMTL HAZARDS
             I
             I
      474.   *************************************** (     19)  20.9 PCT
             I     PERSONNEL ERRORS
             I
             I
      475.   ***** (      2)   2.2 PCT
             I     CAUSED BY OTHR CMPNT
             I
             I
      476.   ********************************* (     16)  17.6 PCT
             I     CONVENIENCE-FOLLOWP
             I
             I
      477.   *************** (      7)   7.7 PCT
             I     MANUFCTRG ERRORS
             I
             I
      478.   ***** (      2)   2.2 PCT
             I     CORROSION
             I
             I
      479.   *** (      1)   1.1 PCT
             I     PROJECTS-EXPERIMNTL
             I
             I
        0.   * (      0)   0.0 PCT
 (MISSING)   I
             I
             I.........I.........I.........I.........I.........I.........I.........I.........I.........I.........I
             0         5        10        15        20        25        30        35        40        45        50
             FREQUENCY

VALID   OBSERVATIONS -        91
MISSING OBSERVATIONS -         0
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FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * C R O S S T A B U L A T I O N O F * * * * *
VAR074 LAMPCHANGER REPLACED WITH REASON BY VAR009 LAMP TYPE
* * * * * PAGE 1 OF 1

VAR074	COUNT / ROW PCT / COL PCT / TOT PCT	VAR009: 0.55 AMP 12VOLT 52.	0.77 AMP 12VOLT 53.	1.15 AMP 12VOLT 54.	ROW TOTAL
ENVRNMTL HAZARDS	472.	0 0.0 0.0 0.0	10 25.0 58.8 15.2	30 75.0 63.8 45.5	40 60.6
PERSONNEL ERRORS	474.	0 0.0 0.0 0.0	7 36.8 41.2 10.6	12 63.2 25.5 18.2	19 28.8
MANUFCTRG ERRORS	477.	2 28.6 100.0 3.0	0 0.0 0.0 0.0	5 71.4 10.6 7.6	7 10.6
COLUMN TOTAL		2 3.0	17 25.8	47 71.2	66 100.0

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

C R O S S T A B U L A T I O N O F
VAR074 LAMPCHANGER REPLACED WITH REASON BY VAR016 SOUND SIGNAL

VAR074	COUNT / ROW PCT / COL PCT / TOT PCT	NO SOUND SIGNAL 0.	WHISTLE 4 BALL 79.	BELL PRE 1952 TP 81.	BELL1952 TAPPER 82.	BELL1962 TAPPER 83.	GONG1952 TAPPER 85.	GONG1962 TAPPER 86.	ROW TOTAL
ENVRNMTL HAZARDS	472.	22 55.0 64.7 33.3	6 15.0 46.2 9.1	1 2.5 20.0 1.5	4 10.0 80.0 6.1	1 2.5 33.3 1.5	1 2.5 100.0 1.5	5 12.5 100.0 7.6	40 60.6
PERSCNNEL ERRORS	474.	10 52.6 29.4 15.2	6 31.6 46.2 9.1	2 10.5 40.0 3.0	1 5.3 20.0 1.5	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	19 28.8
MANUFCTRG ERRORS	477.	2 28.6 5.9 3.0	1 14.3 7.7 1.5	2 28.6 40.0 3.0	0 0.0 0.0 0.0	2 28.6 66.7 3.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	7 10.6
COLUMN TOTAL		34 51.5	13 19.7	5 7.6	5 7.6	3 4.5	1 1.5	5 7.6	66 100.0

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR075 DAYLIGHT CONTROL REP.WTIH REASON

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
ROUTINE SERVICING	501.	6	7.1	7.1	7.1
ENVRNMTL HAZARDS	502.	36	42.4	42.4	49.4
PERSONNEL ERRORS	504.	10	11.8	11.8	61.2
CAUSED BY OTHR CMPNT	505.	3	3.5	3.5	64.7
CONVENIENCE-FOLLOWP	506.	23	27.1	27.1	91.8
MANUFCTRG ERRORS	507.	6	7.1	7.1	98.8
CORROSION	508.	1	1.2	1.2	100.0
	0.	0	0.0	MISSING	100.0
	TOTAL	85	100.0	100.0	100.0

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CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING                    01/15/75        PAGE   69
FILE   ATONAV13 (CREATION DATE = 01/15/75)   100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST
VARIABLE   VAR075      DAYLIGHT CONTROL REP.WTIH REASON
      CODE
           I
      501. ************* (      6)   7.1 PCT
           I     ROUTINE SERVICING
           I
           I
      502. ************************************************************************* (     36)  42.4 PCT
           I     ENVRNMTL HAZARDS
           I
           I
      504. ********************* (     10)  11.8 PCT
           I     PERSONNEL ERRORS
           I
           I
      505. ******* (      3)   3.5 PCT
           I     CAUSED BY OTHR CMPNT
           I
           I
      506. *********************************************** (     23)  27.1 PCT
           I     CONVENIENCE-FOLLOWP
           I
           I
      507. ************* (      6)   7.1 PCT
           I     MANUFCTRG ERRORS
           I
           I
      508. *** (      1)   1.2 PCT
           I     CORROSION
           I
           I
        0. * (      0)   0.0 PCT
 (MISSING) I
           I
           I.........I.........I.........I.........I.........I.........I.........I.........I.........I.........I
           0         5        10        15        20        25        30        35        40        45        50
           FREQUENCY

VALID   OBSERVATIONS -        85
MISSING OBSERVATIONS -         0
```

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR075 DAYLIGHT CONTROL REP.WTIH REASON BY VAR008 LIGHT COLOR
* PAGE 1 OF 1

VAR075 (COUNT / ROW PCT / COL PCT / TOT PCT)	VAR008 WHITE W	RED R	GREEN G	ROW TOTAL
502. ENVRNMTL HAZARDS	14 38.9 77.8 26.9	16 44.4 64.0 30.8	6 16.7 66.7 11.5	36 69.2
504. PERSCNNEL ERRORS	3 30.0 16.7 5.8	5 50.0 20.0 9.6	2 20.0 22.2 3.8	10 19.2
507. MANUFCTRG ERRORS	1 16.7 5.6 1.9	4 66.7 16.0 7.7	1 16.7 11.1 1.9	6 11.5
COLUMN TOTAL	18 34.6	25 48.1	9 17.3	52 100.0

CHI SQUARE = 1.39950 WITH 4 DEGREES OF FREEDOM SIGNIFICANCE = 0.8443
CRAMER'S V = 0.11600
CONTINGENCY COEFFICIENT = 0.16189
KENDALL'S TAU B = 0.10828 SIGNIFICANCE = 0.1236
KENDALL'S TAU C = 0.08765 SIGNIFICANCE = 0.1745
GAMMA = 0.20102
SOMER'S D = 0.09438

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * C R O S S T A B U L A T I O N O F * * *
VAR075 DAYLIGHT CONTROL REP.WTIH REASON BY VAR010 LANTERN-OPTIC
* * * PAGE 1 OF 1

VAR075	COUNT / ROW PCT / COL PCT / TOT PCT	VAR010: 155 MM A CRYLIC 16.	200 MM P .GLASS 20.	200 MM ALLOTHER 23.	ROW TOTAL
ENVRNMTL HAZARDS	502.	27	9	0	36
		75.0	25.0	0.0	69.2
		67.5	81.8	0.0	
		51.9	17.3	0.0	
PERSCNNEL ERRORS	504.	7	2	1	10
		70.0	20.0	10.0	19.2
		17.5	18.2	100.0	
		13.5	3.8	1.9	
MANUFCTRG ERRORS	507.	6	0	0	6
		100.0	0.0	0.0	11.5
		15.0	0.0	0.0	
		11.5	0.0	0.0	
COLUMN TOTAL		40	11	1	52
		76.9	21.2	1.9	100.0

CHI SQUARE = 6.22227 WITH 4 DEGREES OF FREEDOM SIGNIFICANCE = 0.1832
CRAMER'S V = 0.24460
CONTINGENCY COEFFICIENT = 0.32691
KENDALL'S TAU B = -0.08053 SIGNIFICANCE = 0.1947
KENDALL'S TAU C = -0.04993 SIGNIFICANCE = 0.2968
GAMMA = -0.20000
SOMER'S D = -0.09165

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR075 DAYLIGHT CONTROL REP.WTIH REASON BY VAR016 SOUND SIGNAL
* PAGE 1 OF 1

VAR075 \ VAR016 (COUNT / ROW PCT / COL PCT / TOT PCT)	NO SOUND SIGNAL 0.	WHISTLE 4 BALL 79.	BELL PRE 1952 TP 81.	BELL1952 TAPPER 82.	BELL1962 TAPPER 83.	GONG1952 TAPPER 85.	GONG1962 TAPPER 86.	ROW TOTAL
502. ENVRNMTL HAZARDS	19 52.8 63.3 36.5	6 16.7 60.0 11.5	1 2.8 100.0 1.9	3 8.3 100.0 5.8	1 2.8 50.0 1.9	1 2.8 100.0 1.9	5 13.9 100.0 9.6	36 69.2
504. PERSONNEL ERRORS	7 70.0 23.3 13.5	2 20.0 20.0 3.8	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 10.0 50.0 1.9	0 0.0 0.0 0.0	0 0.0 0.0 0.0	10 19.2
507. MANUFCTRG ERRORS	4 66.7 13.3 7.7	2 33.3 20.0 3.8	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	6 11.5
COLUMN TOTAL	30 57.7	10 19.2	1 1.9	3 5.8	2 3.8	1 1.9	5 9.6	52 100.0

CHI SQUARE = 7.01036 WITH 12 DEGREES OF FREEDOM SIGNIFICANCE = 0.8569
CRAMER'S V = 0.25963
CONTINGENCY COEFFICIENT = 0.34467
KENDALL'S TAU B = -0.18146 SIGNIFICANCE = 0.0262
KENDALL'S TAU C = -0.14645 SIGNIFICANCE = 0.0588
GAMMA = -0.35676
SOMER'S D = -0.15865

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

VARIABLE VAR076 LANTERN-OPTIC REP.WITH REASON

VALUE LABEL	VALUE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
ENVRNMTL HAZARDS	512.	40	46.0	46.0	46.0
PERSONNEL ERRORS	514.	8	9.2	9.2	55.2
CONVENIENCE-FOLLOWP	516.	17	19.5	19.5	74.7
MANUFCTRG ERRORS	517.	1	1.1	1.1	75.9
CORROSION	518.	1	1.1	1.1	77.0
PROJECTS-EXPERIMNTL	519.	20	23.0	23.0	100.0
	0.	0	0.0	MISSING	100.0
	TOTAL	87	100.0	100.0	100.0

```
CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING                 01/15/75       PAGE   76
FILE   ATCNAV13 (CREATION DATE = 01/15/75)   100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST
VARIABLE   VAR076     LANTERN-OPTIC REP.WITH REASON
      CODE
            I
      512.  ******************************************************************************** (     40)  46.0 PCT
            I    ENVRNMTL HAZARDS
            I
            I
      514.  **************** (     8)   9.2 PCT
            I    PERSONNEL ERRORS
            I
            I
      516.  ********************************** (     17)  19.5 PCT
            I    CONVENIENCE-FOLLOWP
            I
            I
      517.  *** (      1)   1.1 PCT
            I    MANUFCTRG ERRORS
            I
            I
      518.  *** (      1)   1.1 PCT
            I    CORROSION
            I
            I
      519.  **************************************** (     20)  23.0 PCT
            I    PROJECTS-EXPERIMNTL
            I
            I
        0.  * (      0)   0.0 PCT
  (MISSING) I
            I
            I.........I.........I.........I.........I.........I.........I.........I.........I.........I.........I
            0         5         10        15        20        25        30        35        40        45        50
            FREQUENCY

VALID   OBSERVATIONS -        87
MISSING OBSERVATIONS -         0
```

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * C R O S S T A B U L A T I O N O F * * * * *
VAR076 LANTERN-OPTIC REP.WITH REASON BY VAR003 LOCATION
* * * * * PAGE 1 OF 1

VAR076	COUNT / ROW PCT / COL PCT / TOT PCT	VAR003 PROTECTED RIVER U	BAY,HARB OR PROTE T	SEMI-EXPD RIVER M	EXPOSED RIVER D	EXPOSED BAY,HARB C	EXPCSED SEA COAS B	ROW TOTAL
ENVRNMTL HAZARDS	512.	8	3	2	3	1	23	40
		20.0	7.5	5.0	7.5	2.5	57.5	81.6
		100.0	75.0	66.7	100.0	100.0	76.7	
		16.3	6.1	4.1	6.1	2.0	46.9	
PERSCNNEL ERRORS	514.	0	1	1	0	0	6	8
		0.0	12.5	12.5	0.0	0.0	75.0	16.3
		0.0	25.0	33.3	0.0	0.0	20.0	
		0.0	2.0	2.0	0.0	0.0	12.2	
MANUFCTRG ERRORS	517.	0	0	0	0	0	1	1
		0.0	0.0	0.0	0.0	0.0	100.0	2.0
		0.0	0.0	0.0	0.0	0.0	3.3	
		0.0	0.0	0.0	0.0	0.0	2.0	
	CCLUMN TOTAL	8	4	3	3	1	30	49
		16.3	8.2	6.1	6.1	2.0	61.2	100.0

CHI SQUARE = 4.24666 WITH 10 DEGREES OF FREEDOM SIGNIFICANCE = 0.9355

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* C R O S S T A B U L A T I O N O F *
VAR076 LANTERN-OPTIC REP.WITH REASON BY VAR010 LANTERN-OPTIC
* PAGE 1 OF 1

VAR076	COUNT / ROW PCT / COL PCT / TOT PCT	VAR010: 155 MM ACRYLIC 16.	200 MM P.GLASS 20.	200 MM ALLOTHER 23.	ROW TOTAL
ENVRNMTL HAZARDS	512.	31 77.5 83.8 63.3	9 22.5 81.8 18.4	0 0.0 0.0 0.0	40 81.6
PERSONNEL ERRORS	514.	5 62.5 13.5 10.2	2 25.0 18.2 4.1	1 12.5 100.0 2.0	8 16.3
MANUFCTRG ERRORS	517.	1 100.0 2.7 2.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 2.0
	COLUMN TOTAL	37 75.5	11 22.4	1 2.0	49 100.0

CHI SQUARE = 5.65245 WITH 4 DEGREES OF FREEDOM SIGNIFICANCE = 0.2267

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * C R O S S T A B U L A T I O N O F * * *
VAR076 LANTERN-OPTIC REP.WITH REASON BY VAR016 SOUND SIGNAL
* * * PAGE 1 OF 1

VAR076 (COUNT / ROW PCT / COL PCT / TOT PCT)	VAR016: NO SOUND SIGNAL 0.	WHISTLE 4 BALL 79.	BELL PRE 1952 TP 81.	BELL1952 TAPPER 82.	BELL1962 TAPPER 83.	GONG1952 TAPPER 85.	GONG1962 TAPPER 86.	ROW TOTAL
512. ENVRNMTL HAZARDS	22	6	1	4	1	1	5	40
	55.0	15.0	2.5	10.0	2.5	2.5	12.5	81.6
	95.7	54.5	33.3	80.0	100.0	100.0	100.0	
	44.9	12.2	2.0	8.2	2.0	2.0	10.2	
514. PERSONNEL ERRORS	1	4	2	1	0	0	0	8
	12.5	50.0	25.0	12.5	0.0	0.0	0.0	16.3
	4.3	36.4	66.7	20.0	0.0	0.0	0.0	
	2.0	8.2	4.1	2.0	0.0	0.0	0.0	
517. MANUFCTRG ERRORS	0	1	0	0	0	0	0	1
	0.0	100.0	0.0	0.0	0.0	0.0	0.0	2.0
	0.0	9.1	0.0	0.0	0.0	0.0	0.0	
	0.0	2.0	0.0	0.0	0.0	0.0	0.0	
COLUMN TOTAL	23	11	3	5	1	1	5	49
	46.9	22.4	6.1	10.2	2.0	2.0	10.2	100.0

CHI SQUARE = 16.71225 WITH 12 DEGREES OF FREEDOM SIGNIFICANCE = 0.1607

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FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR077 MOORINGS SP-CODE REP WITH REASON BY VAR003 LOCATION
* PAGE 1 OF 1

VAR077 / VAR003 (COUNT, ROW PCT, COL PCT, TOT PCT)	PROTECTED RIVER U	SEMI-EXPD RIVER M	EXPOSED SEA COAS B	ROW TOTAL
774. LAMP-PERS ERRORS	1 100.0 25.0 12.5	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 12.5
777. LAMP-MNFG ERRORS	3 42.9 75.0 37.5	1 14.3 100.0 12.5	3 42.9 100.0 37.5	7 87.5
COLUMN TOTAL	4 50.0	1 12.5	3 37.5	8 100.0

CHI SQUARE = 1.14286 WITH 2 DEGREES OF FREEDOM SIGNIFICANCE = 0.5647

CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING 01/15/75 PAGE 83

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR077 MOORINGS SP-CODE REP WITH REASON BY VAR004 BUOY SIZE
* PAGE 1 OF 1

VAR077 / VAR004 (COUNT, ROW PCT, COL PCT, TOT PCT)	7 X 17 717.	8 X 23 823.	8 X 26 826.	9 X 32 932.	9 X 38 938.	ROW TOTAL
774. LAMP-PERS ERRORS	0 0.0 0.0 0.0	1 100.0 100.0 12.5	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 12.5
777. LAMP-MNFG ERRORS	1 14.3 100.0 12.5	0 0.0 0.0 0.0	4 57.1 100.0 50.0	1 14.3 100.0 12.5	1 14.3 100.0 12.5	7 87.5
COLUMN TOTAL	1 12.5	1 12.5	4 50.0	1 12.5	1 12.5	8 100.0

CHI SQUARE = 8.00000 WITH 4 DEGREES OF FREEDOM SIGNIFICANCE = 0.0916

CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING 01/15/75 PAGE 84

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

CROSSTABULATION OF VAR077 MOORINGS SP-CODE REP WITH REASON BY VAR009 LAMP TYPE — PAGE 1 OF 1

VAR077 (COUNT / ROW PCT / COL PCT / TOT PCT)	VAR009: 0.77 AMP 12VOLT (53.)	1.15 AMP 12VOLT (54.)	ROW TOTAL
774. LAMP-PERS ERRORS	1 100.0 20.0 12.5	0 0.0 0.0 0.0	1 12.5
777. LAMP-MNFG ERRORS	4 57.1 80.0 50.0	3 42.9 100.0 37.5	7 87.5
COLUMN TOTAL	5 62.5	3 37.5	8 100.0

FISHER'S EXACT TEST = 0.62500

CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING 01/15/75 PAGE 85

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

CROSSTABULATION OF VAR077 MOORINGS SP-CODE REP WITH REASON BY VAR010 LANTERN-OPTIC — PAGE 1 OF 1

VAR077 (COUNT / ROW PCT / COL PCT / TOT PCT)	VAR010: 155 MM ACRYLIC (16.)	200 MM P.GLASS (20.)	ROW TOTAL
774. LAMP-PERS ERRORS	1 100.0 16.7 12.5	0 0.0 0.0 0.0	1 12.5
777. LAMP-MNFG ERRORS	5 71.4 83.3 62.5	2 28.6 100.0 25.0	7 87.5
COLUMN TOTAL	6 75.0	2 25.0	8 100.0

FISHER'S EXACT TEST = 0.75000

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *

VAR077 MOORINGS SP-CODE REP WITH REASON BY VAR016 SOUND SIGNAL

* PAGE 1 OF 1

VAR077 / VAR016 (COUNT, ROW PCT, COL PCT, TOT PCT)	NO SOUND SIGNAL 0.	WHISTLE 4 BALL 79.	BELL1962 TAPPER 83.	ROW TOTAL
774. LAMP-PERS ERRORS	1	0	0	1
	100.0	0.0	0.0	12.5
	25.0	0.0	0.0	
	12.5	0.0	0.0	
777. LAMP-MNFG ERRORS	3	2	2	7
	42.9	28.6	28.6	87.5
	75.0	100.0	100.0	
	37.5	25.0	25.0	
COLUMN TOTAL	4	2	2	8
	50.0	25.0	25.0	100.0

CHI SQUARE = 1.14286 WITH 2 DEGREES OF FREEDOM SIGNIFICANCE = 0.5647

CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING 01/15/75 PAGE 88

FILE ATONAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR077 MOORINGS SP-CODE REP WITH REASON BY VAR003 LOCATION
* PAGE 1 OF 1

VAR077	VAR003: COUNT / ROW PCT / COL PCT / TOT PCT	PROTECTED RIVER U	SEMI-EXPD RIVER M	SEMI-EXPD BAY,HA L	EXPOSED RIVER D	EXPOSED SEA COAS B	ROW TOTAL
771. PRVNT MAINTENANC	COUNT	4	3	1	0	4	12
	ROW PCT	33.3	25.0	8.3	0.0	33.3	34.3
	COL PCT	100.0	100.0	100.0	0.0	15.4	
	TOT PCT	11.4	8.6	2.9	0.0	11.4	
772. WX-WIND-STORM	COUNT	0	0	0	1	22	23
	ROW PCT	0.0	0.0	0.0	4.3	95.7	65.7
	COL PCT	0.0	0.0	0.0	100.0	84.6	
	TOT PCT	0.0	0.0	0.0	2.9	62.9	
COLUMN TOTAL		4	3	1	1	26	35
		11.4	8.6	2.9	2.9	74.3	100.0

CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING 01/15/75 PAGE 89

FILE ATCNAV13 (CREATION DATE = 01/15/75) 100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
VAR077 MOORINGS SP-CODE REP WITH REASON BY VAR018 BOTTOM DESCRIPTION
* PAGE 1 OF 1

VAR077	VAR018: COUNT / ROW PCT / COL PCT / TOT PCT	SAND S	ROCK R	MUD M	GRAVEL G	ROW TOTAL
771. PRVNT MAINTENANC	COUNT	8	2	2	0	12
	ROW PCT	66.7	16.7	16.7	0.0	34.3
	COL PCT	30.8	33.3	100.0	0.0	
	TOT PCT	22.9	5.7	5.7	0.0	
772. WX-WIND-STORM	COUNT	18	4	0	1	23
	ROW PCT	78.3	17.4	0.0	4.3	65.7
	COL PCT	69.2	66.7	0.0	100.0	
	TOT PCT	51.4	11.4	0.0	2.9	
COLUMN TOTAL		26	6	2	1	35
		74.3	17.1	5.7	2.9	100.0

COMPUTER PROGRAM

```
STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES SPSSH - VERSION 5.01          01/14/75          PAGE    1

                     RUN NAME          CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING
                     FILE NAME         ATONAV13  100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST
                     VARIABLE LIST     VAR001 TO VAR090
                     INPUT MEDIUM      CARD
                     # OF CASES        268
                     INPUT FORMAT      FIXED (F6.2,2X,A1,A1,1X,F3.0,1X,F2.0,F1.0,1X,F3.0,1X,A1,1X,F2.0,

                    ACCORDING TO YOUR INPUT FORMAT, VARIABLES ARE TO BE READ AS FOLLOWS

                    VARIABLE   FORMAT   RECORD    COLUMNS

                    VAR001     F 6. 2        1      1-    6
                    VAR002        A 1        1      9-    9
                    VAR003        A 1        1     10-   10
                    VAR004     F 3. 0        1     12-   14
                    VAR005     F 2. 0        1     16-   17
                    VAR006     F 1. 0        1     18-   18
                    VAR007     F 3. 0        1     20-   22
                    VAR008        A 1        1     24-   24
                    VAR009     F 2. 0        1     26-   27
                                             1X,F2.0,A1,A4,A1,F2.0,1X,F2.0,1X,F2.0,1X,F2.0,1X,2A1,
                    VAR010     F 2. 0        1     29-   30
                    VAR011        A 1        1     31-   31
                    VAR012        A 4        1     32-   35
                    VAR013        A 1        1     36-   36
                    VAR014     F 2. 0        1     37-   38
                    VAR015     F 2. 0        1     40-   41
                    VAR016     F 2. 0        1     43-   44
                    VAR017     F 2. 0        1     46-   47
                    VAR018        A 1        1     49-   49
                    VAR019        A 1        1     50-   50
                                               A2,1X,F1.0,1X,F1.0,1X,F1.0,1X,F2.0,1X,F1.0,1X,F2.0,1X,
                    VAR020        A 2        1     51-   52
                    VAR021     F 1. 0        1     54-   54
                    VAR022     F 1. 0        1     56-   56
                    VAR023     F 1. 0        1     58-   58
                    VAR024     F 2. 0        1     60-   61
                    VAR025     F 1. 0        1     63-   63
                    VAR026     F 2. 0        1     65-   66
                                             F1.0,F3.0,1X,F4.0,1X,F1.0,2X,/,A1,3F2.0,A3,11F2.0,F2.1,
                    VAR027     F 1. 0        1     68-   68
                    VAR028     F 3. 0        1     69-   71
                    VAR029     F 4. 0        1     73-   76
                    VAR030     F 1. 0        1     78-   78
                    VAR031        A 1        2      1-    1
                    VAR032     F 2. 0        2      2-    3
                    VAR033     F 2. 0        2      4-    5
```

ACCORDING TO YOUR INPUT FORMAT, VARIABLES ARE TO BE READ AS FOLLOWS

VARIABLE	FORMAT	RECORD	COLUMNS
VAR034	F 2. 0	2	6- 7
VAR035	A 3	2	8- 10
VAR036	F 2. 0	2	11- 12
VAR037	F 2. 0	2	13- 14
VAR038	F 2. 0	2	15- 16
VAR039	F 2. 0	2	17- 18
VAR040	F 2. 0	2	19- 20
VAR041	F 2. 0	2	21- 22
VAR042	F 2. 0	2	23- 24
VAR043	F 2. 0	2	25- 26
VAR044	F 2. 0	2	27- 28
VAR045	F 2. 0	2	29- 30
VAR046	F 2. 0	2	31- 32
VAR047	F 2. 1	2	33- 34

F1.0,4F4.0,F3.0,3F2.0,2F3.1,2A1,F2.0,F4.0,6X/F1.0,F4.0,A4,

VARIABLE	FORMAT	RECORD	COLUMNS
VAR048	F 1. 0	2	35- 35
VAR049	F 4. 0	2	36- 39
VAR050	F 4. 0	2	40- 43
VAR051	F 4. 0	2	44- 47
VAR052	F 4. 0	2	48- 51
VAR053	F 3. 0	2	52- 54
VAR054	F 2. 0	2	55- 56
VAR055	F 2. 0	2	57- 58
VAR056	F 2. 0	2	59- 60
VAR057	F 3. 1	2	61- 63
VAR058	F 3. 1	2	64- 66
VAR059	A 1	2	67- 67
VAR060	A 1	2	68- 68
VAR061	F 2. 0	2	69- 70
VAR062	F 4. 0	2	71- 74
VAR063	F 1. 0	3	1- 1
VAR064	F 4. 0	3	2- 5
VAR065	A 4	3	6- 9

F4.0,A4,2F4.0,2X,F2.0,4X,7A4,2F2.0,A2,3A1,F1.0,2F2.0,3A1,A2)

VARIABLE	FORMAT	RECORD	COLUMNS
VAR066	F 4. 0	3	10- 13
VAR067	A 4	3	14- 17
VAR068	F 4. 0	3	18- 21
VAR069	F 4. 0	3	22- 25
VAR070	F 2. 0	3	28- 29
VAR071	A 4	3	34- 37
VAR072	A 4	3	38- 41
VAR073	A 4	3	42- 45

ACCORDING TO YOUR INPUT FORMAT, VARIABLES ARE TO BE READ AS FOLLOWS

VARIABLE	FORMAT	RECORD	COLUMNS
VAR074	A 4	3	46- 49
VAR075	A 4	3	50- 53
VAR076	A 4	3	54- 57
VAR077	A 4	3	58- 61
VAR078	F 2. 0	3	62- 63
VAR079	F 2. 0	3	64- 65
VAR080	A 2	3	66- 67
VAR081	A 1	3	68- 68
VAR082	A 1	3	69- 69
VAR083	A 1	3	70- 70
VAR084	F 1. 0	3	71- 71
VAR085	F 2. 0	3	72- 73
VAR086	F 2. 0	3	74- 75
VAR087	A 1	3	76- 76
VAR088	A 1	3	77- 77
VAR089	A 1	3	78- 78
VAR090	A 2	3	79- 80

THE INFUT FORMAT PROVIDES FOR 90 VARIABLES. 90 WILL BE READ
IT PROVIDES FCR 3 RECORDS ('CARDS') PER CASE. A MAXIMUM OF 80 'COLUMNS' ARE USED ON A RECORD.

```
COMMENT         ONE - PROGRAM TO CALCULATE PERCENT EXPECTED BATTERY
                      LIFE USED AT THE TIME A BATTERY WAS REPLACED.

COMMENT         VAR069 IS RBDT IN JULIAN DATE FORMAT - THE FOLLOWING CARDS CREATE
                NEW VARIABLE VARBDT WHICH IS RBDT CONVERTED INTO DAYS
IF              (VAR069 GT 0 AND VAR069 LE 365) VARBDT = VAR069
IF              (VAR069 GE 1000 AND VAR069 LE 1365) VARBDT = (VAR069 -1000) +365
IF              (VAR069 GE 2000 AND VAR069 LE 2365) VARBDT = (VAR069 -2000) +730
IF              (VAR069 GE 3000 AND VAR069 LE 3365) VARBDT = (VAR069 -3000) +1095
COMMENT         THE FOLLING CARDS CREATE NEW VARIABLES VARUSE WHICH IS THE TIME
                BATTERY HAS BEEN IN SERVICE IN JULIAN FORMAT AND VARDAY THE SAME
                TIME CONVERTED INTO DAYS - VARDAT IS WORK DATE JULIAN EQUIVALENT
IF              ((VAR051 - VAR062) GE 366) VARDAT = (VAR051 -1000) +365
COMPUTE         VARUSE = VARDAT - VAR062
IF              (VARUSE GE 0 AND VARUSE LE 730) VARDAY = VARUSE
IF              (VARUSE GE 999 AND VARUSE LE 1730) VARDAY = (VARUSE -1000) +365
IF              (VARUSE GE 1999 AND VARUSE LE 2730) VARDAY = (VARUSE -2000) +730
IF              ((VAR051 - VAR062) GE 0 AND (VAR051 - VAR062) LT 366)
                VARDAY = VAR051 - VAR062
COMMENT         VARPER IS NEW VARIABLE PERCENT OF EXPECTED BATTERY LIFE CONSUMED
                AS OF THE WORK DATE BASED UPON RBDT - WHERE THE BATTERY WAS
                REPLACED ON THE WORK DATE THE PERCENT INDICATES SURVIVAL
                PERFORMANCE OF THE OLD BATTERY.
IF              (VAR071 NE ' ') VARPER = RND((VARDAY/VARBDT)*100)
```

```
MISSING VALUES  VAR059,VAR060,VAR081 TO VAR083,VAR087 TO VAR089(' ')/
                VAR080('  ')/VAR035('   ')/
                VAR065,VAR067,VAR071 TO VAR077('    ')/VAR030,
                VAR033,VAR034,VAR037 TO VAR047,VAR055,VAR056,VAR061,VAR064,
                VAR066,VAR068,VAR069,VAR078,VAR079,VAR084 TO VAR086,VARPER(0)
VAR LABELS      VAR001,LIGHT LIST NUMBER/
                VAR002,OPERATION/
                VAR003,LOCATION/
                VAR004,BUOY SIZE/
                VAR005,CONSTRUCTION/
                VAR006,VENT VALVES PER POCKET/
                VAR007,LIGHT CHARACTERISTIC/
                VAR008,LIGHT COLOR/
                VAR009,LAMP TYPE/
                VAR010,LANTERN-OPTIC/
                VAR011,AVAILABLE SPARE CODE/
                VAR012.POWER SOURCE-BATTERY/
                VAR013,BATTERY REUSE CODE/
                VAR014,LAMPCHANGER/
                VAR015,FLASHER/
                VAR016,SOUND SIGNAL/
                VAR017,DAYLIGHT CONTROL/
                VAR018,BOTTOM DESCRIPTION/
                VAR019,BOTTOM CHARACTERISTIC/
                VAR020,DEPTH OF WATER IN FEET/
                VAR021,BRIDLE SIZE/
                VAR022,SWIVEL SIZE AND NUMBER/
                VAR023,FIRST CHAIN SIZE/
                VAR024,FIRST CHAIN LENGTH IN FATHOMS/
                VAR025,SECOND CHAIN SIZE/
                VAR026,SECOND CHAIN LENGTH/
                VAR027,NUMBER OF SINKERS/
                VAR028,TOTAL SINKER WEIGHT-RIPRAP DIST./
                VAR029,AID CONTROL NUMBER/
                VAR030,TOTAL NUMBER OF VISITS TO EACH AID,72-73/
                VAR031,WORK REASON/
                VAR032,INITIAL CONDITION OF AID/
                VAR033,INITIAL CONDITION OF AID/
                VAR034,INITIAL CONDITION OF AID/
                VAR035,DISTANCE 10'S YARDS OFF STATION/
                VAR036,WORK PERFORMED/
                VAR037,WORK PERFORMED/
                VAR038,WORK PERFORMED/
                VAR039,WORK PERFORMED/
                VAR040,WORK PERFORMED/
                VAR041,WORK PERFORMED/
                VAR042,WORK PERFORMED/
                VAR043,WORK PERFORMED/
                VAR044,WORK PERFORMED/
                VAR045,WORK PERFORMED/
                VAR046,WORK PERFORMED/
                VAR047,TIME SPENT ON SITE-TENTHS HOURS/
                VAR048,TOTAL NO. OF DISCREPANCIES OF AID/
                VAR049,JULIAN DATE CG INFORMED DISCREP/
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               VAR050,HOUR CG INFORMED OF DISCREPANCY/
               VAR051,J.DATE WORK PERFORMED-OR 3365END/
               VAR052,HOUR WORK PERFORMED/
               VAR053,DAYS INITIAL NOTN TIL NEXT VISIT/
               VAR054,FINAL CONDITION OF AID/
               VAR055,FINAL CONDITION OF AID/
               VAR056,FINAL CONDITION OF AID/
               VAR057,CLOSED CIRCUIT VOLT NEW BATTERY/
               VAR058,CLOSED VOLT OLD-EXISTING BATTERY/
               VAR059,UNIT WORK PERFORMED BY/
               VAR060,PRIMARY METHOD OF POSITIONING/
               VAR061,PRIMARY CAUSE OF FAILURE-SANDS/
               VAR062,JULIAN DATE LAST RECHARGED/
               VAR063,EXTRA CODE/
               VAR064,SCHEDULED SERVICE DATE/
               VAR065,DAYS SERVICE IN VARIANCE SCHED/
               VAR066,SCHEDULED RELIEF-WITHDRAWL DATE/
               VAR067,DAYS RELIEF IN VARIANCE SCHED/
               VAR068,SCHEDULED RECHARGE DATE/
               VAR069,RATED BATTERY DISCHARGE TIME/
               VAR070,NO.BURNED OUT LAMPS REPLACED/
               VAR071,POWER UNIT,S REPLACED WITH REASON/
               VAR072,BUOY RELIEVED WITH REASON/
               VAR073,FLASHER REPLACED WITH REASON/
               VAR074,LAMPCHANGER REPLACED WITH REASON/
               VAR075,DAYLIGHT CONTROL REP.WITH REASON/
               VAR076,LANTERN-OPTIC REP.WITH REASON/
               VAR077,MOORINGS SP-CODE REP WITH REASON/
               VAR078,MAIN CAUSE FOR FAILURE OR RELATED NOTE/
               VAR079,MAIN CAUSE FOR FAILURE OR RELATED NOTE/
               VAR080,COMPONENT LOST-DAMAGED DURING SERVICING/
               VAR081,REASON DELAY IF DISCREP REPORTED/
               VAR082,NATURE OF SERVICE/
               VAR083,REASON WHY IF TEMPORARY/
               VAR084,NO.VISITS RELATED EACH DISCREP/
               VAR085,COMPONENT REQUIRED IF TEMPORARY/
               VAR086,DAYS TIME TO EFFECT PERM SERVICE/
               VAR087,COMMENT AND ERROR CODES/
               VAR088,COMMENT AND ERROR CODES/
               VAR089,COMMENT AND ERROR CODES/
               VAR090,ANALYSIS CARD CODE/
               VARPER,PERCENT EXPECTED BATTERY LIFE USED/
VALUE LABELS   VAR001 (1279)COOS BY CH LB 18/
               VAR002 ('P')PERMANENT AID('T')TEMPORARY AID('S')SEASONAL-NO REPCT
               ('W')WINTER REPLACEMENT('O')AID DISCONTINUED/
               VAR003 ('B')EXPOSED SEA COAST('C')EXPOSED BAY,HARBOR('D')EXPOSED
               RIVER('E')EXPOSED BREAKWATER('F')EXPOSED ASHORE('K')SEMI-EXPD SEA
               COAST('L')SEMI-EXPD BAY,HARBOR('M')SEMI-EXPD RIVER ('N')SEMI-EXPD
               BREAKWATER('O')SEMI-EXPD ASHORE('S')PROTECTED SEA COAST ('T')BAY,
               HARBOR PROTECTED('U')PROTECTED RIVER('V')PROTECTEDBREAKWATER('W')
               PROTECTED ASHORE(' ')AID DISCONTINUED/
               VAR004(510)5 X 10(511)5 X 11(620)6 X 20 (715)7 X 15(717)7 X 17
               (820)8 X 20(823)8 X 23 (826)8 X 26(932)9 X 32(934)9 X 34
               (938)9 X 38(039)10 X 39(0)AID DISCONTINUED/
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VAR005 (11)RR,WLD,STOPCK,LRGVTS(51)RR,STOPOKS,LRGVTS/
VAR006 (1)1,BALL INSTALLED(2)2,BALLS INSTLD(3)1 VENT ,NO BALLS(4)
2 VENTS,NO BALLS(5)OTHER/
VAR007 (103)QK FL   0.3(122)QK FL * ALLOTHER(145)MO A.4FL.6EC,2.0
-5(146)MO A*ALL OTHERS(255)FL 2.5  .5**(251)FL 2.5  .05*(404)FL 4
 .4(630)E INT   6 3.0/
VAR008 ('W')WHITE ('R')RED ('G')GREEN/
VAR009 (51)0.25 AMP 12VOLT(52)0.55 AMP 12VOLT(53)0.77 AMP 12VOLT
(54)1.15 AMP 12VOLT(55)1.35 AMP 12VOLT(56)2.03 AMP 12VOLT (57)
3.03 AMP 12VOLT/
VAR010 (16)155 MM ACRYLIC (20)200 MM P.GLASS(23)200 MM  ALLOTHER/
VAR011 ('U')UNLIGHTED SET 3365/
VAR012 ('10E2')1000 A-H,EDISON#2('10JS')1000 A-H,EDISONJS('20E2')
2000 A-H,2EDISON#2('20JS')1000 A-H,2EDISON JR ('20S1')2000 A-H,2
EDSN STA  ('20S2')2000 A-H,2EDSN ST   ('10S1')1000 A-H,EDISON STA
('10S2')1000 A-H,EDISON ST('25BY')2500 A-H,EDISON-OLD('50BY')5000
A-H,EDISON-OLD('30E2')3000 A-H,EDISON#2('30S1')3000 A-H,EDISONSTA
('60E2')6000 A-H,2EDSN#2('60S1')6000 A-H,2 EDSN STA('20U1')2000 A
-H,2UN CARBIDE/
VAR013 (' ')CONTINUOUS ('S')SECOND YEAR UNIT('T')THIRD YEAR UNIT/
VAR014 (97)4 LAMP,FU-1297(65)6 LAMP,C66P CRDC(66)6LAMP,C66PVAPAK/
VAR015 (65)C-R S-1065 SS(81)C6-181 C-R DEV.(83)VAFAIR/
VAR016(40)ELECTRIC FCRN850-02(79)WHISTLE 4 BALL(81)BELL PRE 1952
TPR(82)BELL1952 TAPPER(83)BELL1962 TAPPER(85)GONG1952 TAPPER(86)G
ONG1962 TAPPER(0)NO SOUND SIGNAL(78)WHISTLE 2 BALL/
VAR017 (31)C-CLEAR ALL(32)R-COLOR PLASTIC    (33)B-COLOR GLASS
(11)CR-S1065-ESI(1 )CR-S1065-ES MAID FLR/
VAR018 ('G')GRAVEL('H')BOULDERS('I')CLAY('J')SHELLS('K')CORAL
('L')LAVA('M')MUD('N')CHALK('O')STONES('P')PEBBLES('Q')SHINGLE
('R')ROCK('S')SAND/
VAR019 (1)FINE(2)COARSE(3)SOFT(4)HARD(5)STIFF(6)STICKY/
VAR021 (1)7-8" X 10'(2)1" X12'(3)1" X 15'(4)1 1-4" X 15' (5)
1 1-4" X 25'(6)1 1-2" X 18'(7) 1 1-2" X 26' (9)OTHER/
VAR022 (2)1 1-2" 3RD CLASS(3)1 3-4" 2ND CLASS(4)2" 1ST CLASS
(5)TWO 1 1-4"(6)TWO 1 1-2"(7)TWO 1 3-4"(8)TWO 2" (9)OTHER/
VAR023 (4)1"(5)1 1-8"(6)1 1-4"(7)1 1-2"(8)1 5-8"AND LARGER/
VAR030 (1)1 VISIT(2)2 VISITS(3)3 VISITS(4)4 VISITS(5)5 VISITS
(6)6 VISITS(7)7 VISITS(8)8 VISITS(9)9 VISITS/
VAR031 (1)ROUTINE (2)SEASONAL CHANGE(3)TEMPORARY CHANGE(4)END
TEMP CHANGE(5)DISCREP REPORTED (6)DISCREP DISCOVERED(7)PROJECT(8)
SEE COMMENTS(9)SEE COMMENTS('A')SEE COMMENTS('B')SEE COMMENTS
('C')SEE COMMENTS  ('D')SEE COMMENTS('E')SEE COMMENTS  ('M')SEE
COMMENTS ('O')SEE COMMENTS('L')SEE COMMENTS('N')SEE COMMENTS('T')
SEE COMMENTS('W')SEE COMMENTS ('U')SEE COMMENTS('S')SEE COMMENTS/
VAR032 (00)NORMAL (01)LIGHT EXTENGSHD,DIM (02)IMPROPER LT CHAR
(03)SOUND SIG DISCREP (04)RADIOBEAC DISCREP (05)OFF STATION   (6)
AGROUND (07)SINKING (10)DAMAGED (11)DESTROYED (12)MISSING
(54)SOUND DEV NOTINEFFCT(55)BUOYBADLYDETERIATED(68)POCKTCOVBNDMSG
(88)POCKET FLOODED (90)LANTER FLOODED (91)BAD WIRING (93)LT FLS
DAYLIGHT (94)WITHDRAWN(95)SUNK(96)ADRIFT (97)POCKETCOVERMISSING
(98)LAMPCHGR WONT ROTATE(99)OTHER/
VAR033 (00)NORMAL (01)LIGHT EXTENGSHD,DIM (02)IMPROPER LT CHAR
(03)SOUND SIG DISCREP (04)RADIOBEAC DISCREP (05)OFF STATION   (6)
AGROUND (07)SINKING (10)DAMAGED (11)DESTROYED (12)MISSING
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(54)SOUND DEV NOTINEFFCT(55)BUOYBADLYDETERIATED(68)POCKTCOVBNDMSG
(88)POCKET FLOODED (90)LANTER FLOODED (91)BAD WIRING (93)LT FLS
DAYLIGHT (94)WITHDRAWN(95)SUNK(96)ADRIFT (97)POCKETCOVERMISSING
(98)LAMPCHGR WONT ROTATE(99)OTHER/
VAR034 (00)NORMAL (01)LIGHT EXTENGSHD,DIM (02)IMPROPER LT CHAR
(03)SOUND SIG DISCREP (04)RADIOBEAC DISCREP (05)OFF STATION   (6)
AGROUND (07)SINKING (10)DAMAGED (11)DESTROYED (12)MISSING
(54)SOUND DEV NOTINEFFCT(55)BUOYBADLYDETERIATED(68)POCKTCOVBNDMSG
(88)POCKET FLOODED (90)LANTER FLOODED (91)BAD WIRING (93)LT FLS
DAYLIGHT (94)WITHDRAWN(95)SUNK(96)ADRIFT (97)POCKETCOVERMISSING
(98)LAMPCHGR WONT ROTATE(99)OTHER/
VAR054 (00)NORMAL (01)LIGHT EXTENGSHD,DIM (02)IMPROPER LT CHAR
(03)SOUND SIG DISCREP (04)RADIOBEAC DISCREP (05)OFF STATION   (6)
AGROUND (07)SINKING (10)DAMAGED (11)DESTROYED (12)MISSING
(54)SOUND DEV NOTINEFFCT(55)BUOYBADLYDETERIATED(68)POCKTCOVBNDMSG
(88)POCKET FLOODED (90)LANTER FLOODED (91)BAD WIRING (93)LT FLS
DAYLIGHT (94)WITHDRAWN(95)SUNK(96)ADRIFT (97)POCKETCOVERMISSING
(98)LAMPCHGR WONT ROTATE(99)OTHER/
VAR055 (00)NORMAL (01)LIGHT EXTENGSHD,DIM (02)IMPROPER LT CHAR
(03)SOUND SIG DISCREP (04)RADIOBEAC DISCREP (05)OFF STATION   (6)
AGROUND (07)SINKING (10)DAMAGED (11)DESTROYED (12)MISSING
(54)SOUND DEV NOTINEFFCT(55)BUOYBADLYDETERIATED(68)POCKTCOVBNDMSG
(88)POCKET FLOODED (90)LANTER FLOODED (91)BAD WIRING (93)LT FLS
DAYLIGHT (94)WITHDRAWN(95)SUNK(96)ADRIFT (97)POCKETCOVERMISSING
(98)LAMPCHGR WONT ROTATE(99)OTHER/
VAR055 (00)NORMAL (01)LIGHT EXTENGSHD,DIM (02)IMPROPER LT CHAR
(03)SOUND SIG DISCREP (04)RADIOBEAC DISCREP (05)OFF STATION   (6)
AGROUND (07)SINKING (10)DAMAGED (11)DESTROYED (12)MISSING
(54)SOUND DEV NOTINEFFCT(55)BUOYBADLYDETERIATED(68)POCKTCOVBNDMSG
(88)POCKET FLOODED (90)LANTER FLOODED (91)BAD WIRING (93)LT FLS
DAYLIGHT (94)WITHDRAWN(95)SUNK(96)ADRIFT (97)POCKETCOVERMISSING
(98)LAMPCHGR WONT ROTATE(99)OTHER/
VAR059 ('P')PRIMARY('S')SECONDARY('N')OTHER/
VAR060 ('S')SEXTANT ANGLES('V')VISUAL BEARINGS,RNG   ('R')RADAR
RANGES('K')NOT CHECKED ('W')WITHDRAWN/
VAR061 (00)NORMAL(01)OMITTED-DISCRE(02)COLCTD 452.04DMGS   (03)
FALSE ALARM (22)BATTERY FAILURE (23)TARDY SERVICE (24)PERS ERROR
(26)FLOODED (27)CAUGHT DOWN (28)WEATHER (29)ICE(30)COLLISION (31)
VANDALISM (33)UNKNOWN(45)LAMPS(51)LANTERN(52)SOUND SIGNAL(53)
TAPPERS(58)WIRING (59)SHACKLE(60)BRIDLE(61)FIRST CHAIN (62)SECOND
CHAIN(63)SINKER/
VAR072 (433)COLLISION (435)WEATHER/
VAR073 (466)COLLISION/
VAR076 (5200)OPORDER 152-72(5100)OPORDER 067-71/
VAR078(00)NONE    (01) OMITTED-DISCY(03)FALSE ALARM(22)POWER-BATTE
RY(23)TARDY SERVICE(24)PERSONNEL ERROR(25)WORN-BKN MOORINGS(26)FL
OODED(27)CAUGHT DOWN(28)WEATHER(29)ICE(30)COLLISION(31)VANDALISM
(33)UNKNOWN(45)ALL LAMPS(46)FLASHER(47)LAMPCHANGER(50)DAYLIGHT CO
NTROL(51)LANTERN(52)SOUND SIGNAL(53)TAPPERS(58)WIRING(59)SHACKLE
(60)BRIDLE(61)FIRST CHAIN(62)SECOND CHAIN(63)SINKER(67)MOORINGS
(69)BUOY DETIORATION(70)MOORINGS RPLD PVOS(72)POCK COV MSG (73)PE
RSNL BELVD PM REQ(81)COBN WX,VDZ,UKN,PE(84)2ND CONSCV DISCY(85)3R
D + CONSCV DISCY(88)SWIVEL(92)VEE BAND/
VAR079(00)NONE    (01) OMITTED-DISCY(03)FALSE ALARM(22)POWER-BATTE
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                RY(23)TARDY SERVICE(24)PERSONNEL ERROR(25)WORN-BKN MOORINGS(26)FL
                OODED(27)CAUGHT DOWN(28)WEATHER(29)ICE(30)COLLISION(31)VANDALISM
                (33)UNKNOWN(45)ALL LAMPS(46)FLASHER(47)LAMPCHANGER(50)DAYLIGHT CO
                NTROL(51)LANTERN(52)SOUND SIGNAL(53)TAPPERS(58)WIRING(59)SHACKLE
                (60)BRIDLE(61)FIRST CHAIN(62)SECOND CHAIN(63)SINKER(67)MOORINGS
                (69)BUOY DETIORATION(70)MOORINGS RPLD PVUS(72)POCK COV MSG (73)PE
                RSNL BELVD PM REQ(81)CCBN WX,VDZ,UKN,PE(84)2ND CONSCV DISCY(85)3R
                D + CONSCV DISCY(83)SWIVEL(92)VEE BAND/
                VAR080 ('LM')LOST MOORINGS('DB')DAMAGED BATTERIES('MI') BUOY NOT
                FOUND('BY')BY FOUND OR SALVGD('BL')BUOY LOST NOT SALVGD/
PRINT FORMAT    VAR002,VAR003,VAR008,VAR011 TO VAR013,VAR018 TO VAR020,VAR031,
                VAR035,VAR059,VAR060,VAR065,VAR067,VAR071 TO VAR077,
                VAR080 TO VAR083,
                VAR087 TO VAR090 (A)/VAR001 (2)/VAR004 TO VAR007,VAR009,VAR010,
                VAR014 TO VAR017,VAR021 TO VAR030,VAR032 TO VAR034,
                VAR036 TO VAR046,VAR048 TO VAR056,VAR061 TO VAR064,VAR066,
                VAR068 TO VAR070,VAR078,VAR079,VAR084 TO VAR086 (0)/VAR047,
                VAR057,VAR058 (1)
CODEBOOK        VAR030
OPTIONS         4
STATISTICS      ALL


COMMENT         TWO - EXPLANATION OF BASIC CODES USED FOR INDICATING
                      REASON FOR COMPONENT REPLACEMENT.

                      A - RECHARGED. ERROR COMDT INST  10500.32A
                      B - DAMAGED BY SOUND DEVICE
                      C - CONVENIENCE
                      E - BUOY WAS RELIEVED EARLY
                      G - MISSING BUOY
                      H - DUE TO POOR PAST PERFORMANCE, TRIED A NEW TYPE
                      I - ICE
                      J - LIGHTED BUOY TEMPORARILY RELIEVED BY AN UNLIGHTED BUOY
                      K - NO INDICATED REASON
                      L - COLLISION
                      M - PRVNT MAINTENANCE
                      N - PREPLANNED LANTERN REPLACEMENT
                      O - LANTERN WAS CRACKED OR THE LANTERN GASKET LEAKED
                      R - CORROSION
                      S - ROUTINE SERVICING
                      T - RECHARGED FOLLOWING TEMPORARY HOTPACK
                      U - SEASONAL LIGHTED BUOY COMMISIONED
                      W - WEATHER, WIND, STORM
                      X - LIGHTED BUOY RESET FOLLOWING A TEMPORARY DISCREPANCY
                      Y - POLICY - ECONOMIZE
                      DN- SINKING
                      DY- VEE BAND MISSING, FLOODED
                      DX- POCKET COVER MISSING,FLOODED
                      DZ- WATER DAMAGE
                      FI- IMPROPER INSTALLATION
                      FP- IMPROPER PROGRAMMING
```

FS- TARDY SERVICING
FR- WRONG REPAIR
FA- ENTIRE LANTERN ASSEMBLY REPLACED
FD- DEFECTIVE
FW- WORN OUT
FU- UNKNOWN
FC- COMBINATION- DEFECTIVE WORN OUT OR UNKNOWN
FL- LOOSE LENS- SCREWS
FV- BELOW 10.8 VOLTS
PA- OPORD 134-72
PB- OPORD 160-71
PC- OPORD 127-73
PD- OPORD 094-72
PE- OPORD 054-73
PF- OPORD 067-71
PG- OPORD 152-72
PH- OPORD 180-73
PI- OPORD 161-72
PJ- OPORD 185-73
QE- RECHARGED 90 OR MORE DAYS BEFORE SCHEDULED DATE
QM- RECHARGED MORE THAN 90 DAYS BEYOND SCHEDULED DATE
TO- TEMPORARY UNLIGHTED BUOY RELIEF
TB- COMPONENTS REPLACED FOLLOWING TEMPORARY UNL BUOY
VA- CCGD13 INST
VB- CG-4500 LIST
VC- CCGD13R261802ZJUN72
ZF- VANDALISM-FORCE
ZG- VANDALISM-GUN
ZT- VANDALISM-THEFT

COMMENT THREE - EXPLANATION OF COMPONENT NUMBERING CODES. USING FOR EXAMPLE, '46FD', THE '46' INDICATES THAT A FLASHER WAS REPLACED AND THE 'FD' INDICATES THAT THE FLASHER WAS REPLACED BECAUSE IT WAS DEFECTIVE. NUMBERS RELATE TO SANDS COLUMNS AND CODING WHERE POSSIBLE. BASIC COLUMNS ARE 42,43,45,46,47,50,51,64.

42 BATTERIES REPLACED
43 BUOY RELIEVED
45 LAMPS REPLACED (PROJECT OR PRIMARY CAUSE OF FAILURE)
46 FLASHER REPLACED
47 LAMPCHANGER REPLACED
50 DAYLIGHT CONTROL REPLACED
51 REPLACED LANTERN
58 REWIRED (64 COL)
59 REPLACED SHACKLE(S) (64 COL)
60 REPLACED BRIDLE (64 COL)
61 REPLACED FIRST CHAIN (64 COL)
62 REPLACED SECOND CHAIN (64 COL)
63 REPLACED SINKER (64 COL)
64 REPLACED ENTIRE MOORING
67 CHANGED TYPE CHARACTERISTIC (NON-SEASONAL CHANGE ONLY)
70 LBUOY ESTABLISHED PERMANENTLY (43 COL)

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71  COMMISSIONED (NON-SEASONAL CHANGE ONLY) (43 COL)
72  DISCONTINUED PERMANENTLY (42 COL)
73  LBUOY WITHDRAWN-REPLACED BY UNLIGHTED WINTER MARKER,
    (43 COL)
    MOORING CHANGES INDICATED
    MORRING CHANGES INDICATED (43 COL)
74  RELIEVED BUOY AND REPLACE ENTIRE MOORING (43,64 COL)
75  REPLACED LANTERN AND ALL INTERNAL COMPONENTS (51 COL)
76  REPLACED SHACKLE(S) AND SECOND CHAIN (64 COL)
77  REPLACED SHACKLE(S) AND FIRST CHAIN  (64 COL)
78  REPLACED BRIDLE FIRST CHAIN (64 COL)
79  REMOVED SOUND SIGNAL (50 COL)
80  INSTALLED-REPLACED SOUND SIGNAL (50 COL)
81  INSTALLED HOTPACK-REASON FOR BATTERY REPLACEMENT GIVEN
    (42 COL)
82  REPLACED SECOND CHAIN AND SINKER (64 COL)
83  COMMENCED SEASONAL LBUOY-REPLACED UNLIGHTED WINTER
    MARKER, MOORING CHANGES INDICATED (43 COL)
84  LBUOY TEMPORARILY REPLACED BY UNLIGHTED BUOY (43 COL)
85  REPLACED BRIDLE, SWIVEL, SECOND CHAIN (64 COL)
86  COMMENCED SEASONAL LBUOY-COMMISSIONED AS NO WINTER
    MARKER WAS USED, INCLUDES MOORINGS (43 COL)
87  LBUOY WITHDRAWN -NOT REPLACED BY WINTER MARKER (43 COL)
88  REPLACED SWIVEL (64 COL)
89  LBUOY TEMPORARILY RELIEVED BY UNLIGHTED BUOY WAS RESET
    (43 COL)
```

READ INPUT DATA


```
***** GIVEN SPACE ALLOWS FOR   1 VARIABLES AND  1498 VALUES FOR CODEBOOK *****

*SELECT IF     (VAR051 EQ 3365)
CODEBOOK       VAR002,VAR003,VAR006,VAR008 TO VAR010,VAR012,VAR014 TO VAR018,
               VAR021 TO VAR023

COMMENT        THE ABOVE CARDS ARE USED TO INDICATE THE NUMBER OF AIDS AND AID
               COMPONENTS IN SERVICE AS OF 31 DECEMBER 1973.  SANDS MANUAL CODES
               ARE UTILIZED.  ONE AID WAS DISCONTINUED DURING 1973 AND APPEARS
               AS CODE 0,0, OR BLANK.
```

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CCOEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING                01/14/75        PAGE   30

***** GIVEN SPACE ALLOWS FOR  15 VARIABLES AND   392 VALUES FOR CODEBOOK *****

                 *SELECT IF     (VAR051 EQ 3365)
                 CROSSTABS      VAR002,VAR004,VAR006 TO VAR010,VAR012,VAR014 TO VAR018,VAR021 TO
                                VAR023 BY VAR003/VAR004 BY VAR006,VAR007,VAR016,VAR023/VAR015 BY
                                VAR007/VAR010 BY VAR017

                 COMMENT        * NON-STANDARD FLASHER        ** FL 2.5 (0.5) AND FL 6.0 (1.0)
                                FLASHERS WERE TO BE PERMANENTLY REPLACED BY FL 2.5 (0.3) AND
                                FL 6.0 (0.6) FLASHERS RESPECTIVELY COMMENCING IN 1973


CCOEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING                01/14/75        PAGE   61

***** GIVEN SPACE ALLOWS FOR  3749 CELLS AND   2 DIMENSIONS FOR CROSSTABS *****

                 *SELECT IF     (VAR051 EQ 3365)
                 MARGINALS      VAR005,VAR024

                 COMMENT        BUOY CONSTRUCTION CODE 11 INDICATES THAT A BUOY IS WELDED AND
                                EQUIPPED WITH A RADAR REFLECTOR, STANDARD POCKECTS, AND LARGE
                                VENTS.
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CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING              01/14/75        PAGE   64

***** GIVEN SPACE ALLOWS FOR   2 VARIABLES AND  2142 VALUES FOR MARGINALS *****

                 CODEBOCK       VAR071,VAR072


                 COMMENT        USE CODE TABLE ON PROGRAM PAGES 8 AND 9 AS REFERENCE FOR LABELS.


CODEBOCK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING              01/14/75        PAGE   69

***** GIVEN SPACE ALLOWS FOR   2 VARIABLES AND  1248 VALUES FOR CODEBOOK *****

                 *RECODE        VAR072 ('43W','84W'=435)('43L'=433)
                 *SELECT IF     ((VAR072 EQ 433 OR VAR072 EQ 435) AND VAR004 NE 0 AND VAR004 NE
                                820)
                 CROSSTABS      VAR072 BY VAR004


CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING              01/14/75        PAGE   71

***** GIVEN SPACE ALLOWS FOR  3749 CELLS AND   2 DIMENSIONS FOR CROSSTABS *****

                 *RECODE        VARPER (1 THRU 20=10)(21 THRU 40=30)(41 THRU 60=50)
                                      (61 THRU 70=65)(71 THRU 80=75)(81 THRU 90=85)
                                      (91 THRU 100=95)(101 THRU 110=105)(111 THRU 121=115)
                                (122 THRU HIGHEST=150)
                 CROSSTABS      VAR072 BY VARPER


                 COMMENT        THE ABOVE CARDS REGROUP PERCENT OF BATTERY LIVES REALIZED.  FOR
                                EXAMPLE, POWER UNITS THAT CONSUMED 71% TO 80% OF THEIR EXPECTED
                                TOTAL USEFUL LIVES ARE ALL CLASSIFIED AS HAVING 75% CONSUMPTION
                                AT THE TIME OF REPLACEMENT.
```

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CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING                01/14/75        PAGE   74

 ***** GIVEN SPACE ALLOWS FOR  3749 CELLS AND   2 DIMENSIONS FOR CROSSTABS *****

                *RECODE        VAR072 ('43L'=433)('43W','84W'=435)
                *SELECT IF     (VAR072 EQ 433 OR VAR072 EQ 435)
                CROSSTABS      VAR072 BY VAR003


CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING                01/14/75        PAGE   76

 ***** GIVEN SPACE ALLOWS FOR  3749 CELLS AND   2 DIMENSIONS FOR CROSSTABS *****

                *RECODE        VAR072 ('43L'=433)('43W','84W'=435)
                *SELECT IF     ((VAR072 EQ 433 OR VAR072 EQ 435) AND VAR051 NE 3365)
                CROSSTABS      VAR072 BY VAR051


CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING                01/14/75        PAGE   80

 ***** GIVEN SPACE ALLOWS FOR  3749 CELLS AND   2 DIMENSIONS FOR CROSSTABS *****

                CODEBOOK       VAR073
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CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING                01/14/75        PAGE   82

 ***** GIVEN SPACE ALLOWS FOR   1 VARIABLES AND  1498 VALUES FOR CODEBOOK *****

                     *RECODE         VAR073 ('46L'=466)
                     *SELECT IF      (VAR073 EQ 466)
                     CROSSTABS       VAR073 BY VAR001

                     COMMENT         THE PREVIOUS TABULATION REVEALED THAT 12 FLASHERS WERE
                                     REPLACED BECAUSE THE BUOY THEY WERE EACH INSTALLED UPON WAS
                                     INVOLVED IN A COLLISION WITH A PASSING VESSEL.  THE ABOVE CARDS
                                     ENABLE EACH COLLISION TO BE IDENTIFIED WITH AID LIGHT LIST
                                     NUMBERS TO LOCATE ANY AID THAT IS COLLISION PRONE.

CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING                01/14/75        PAGE   85

 ***** GIVEN SPACE ALLOWS FOR  3749 CELLS AND   2 DIMENSIONS FOR CROSSTABS *****

                     MARGINALS       VAR070,VAR074

CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING                01/14/75        PAGE   88

 ***** GIVEN SPACE ALLOWS FOR   2 VARIABLES AND  2142 VALUES FOR MARGINALS *****

                     *RECODE         VAR076 ('51PG'=5200)('51PF'=5100)
                     *SELECT IF      (VAR076 EQ 5200 OR VAR076 EQ 5100)
                     CROSSTABS       VAR076 BY VAR001

                     COMMENT         THE ABOVE CARDS ARE USED TO INDICATE THOSE LANTERNS REPLACED
                                     AS A RESULT OF DISTRICT PROJECTS,REPLACING GLASS WITH ACRYLIC
                                     LANTERNS FOR EXAMPLE.
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CODEBOCK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING                    01/14/75        PAGE    90

 ***** GIVEN SPACE ALLOWS FOR  3749 CELLS AND   2 DIMENSIONS FOR CROSSTABS *****

                    CODEBOCK        VAR078,VAR079

                    COMMENT         IN THE FOLLOWING TABLES,CAUSES OF AID FAILURES OR RELATED NOTES
                                    ARE PRESENTED.

CODEBOCK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING                    01/14/75        PAGE    93

 ***** GIVEN SPACE ALLOWS FOR   2 VARIABLES AND  1248 VALUES FOR CODEBOOK *****

                    CODEBOOK        VAR080

CODEBOOK,MARGINALS,CROSSTABULATIONS BEFORE BREAKDOWN RECODING                    01/14/75        PAGE    95

 ***** GIVEN SPACE ALLOWS FOR   1 VARIABLES AND  1498 VALUES FOR CODEBOOK *****

                    FINISH
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RUN NAME        CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING
FILE NAME       ATONAV13  100 LIGHTED BUOYS FOR CAL YEARS 72-73 IN 13TH CGDIST
VARIABLE LIST   VAR001 TO VAR090
INPUT MEDIUM    CARD
# OF CASES      268
INPUT FORMAT    FIXED (F6.2,2X,A1,A1,1X,F3.0,1X,F2.0,F1.0,1X,F3.0,1X,A1,1X,F2.0,

ACCORDING TO YOUR INPUT FORMAT, VARIABLES ARE TO BE READ AS FOLLOWS

VARIABLE   FORMAT   RECORD    COLUMNS

VAR001     F 6. 2       1       1-    6
VAR002        A 1       1       9-    9
VAR003        A 1       1      10-   10
VAR004     F 3. 0       1      12-   14
VAR005     F 2. 0       1      16-   17
VAR006     F 1. 0       1      18-   18
VAR007     F 3. 0       1      20-   22
VAR008        A 1       1      24-   24
VAR009     F 2. 0       1      26-   27
                        1X,F2.0,A1,A4,A1,F2.0,1X,F2.0,1X,F2.0,1X,F2.0,1X,2A1,
VAR010     F 2. 0       1      29-   30
VAR011        A 1       1      31-   31
VAR012        A 4       1      32-   35
VAR013        A 1       1      36-   36
VAR014     F 2. 0       1      37-   38
VAR015     F 2. 0       1      40-   41
VAR016     F 2. 0       1      43-   44
VAR017     F 2. 0       1      46-   47
VAR018        A 1       1      49-   49
VAR019        A 1       1      50-   50
                          A2,1X,F1.0,1X,F1.0,1X,F1.0,1X,F2.0,1X,F1.0,1X,F2.0,1X,
VAR020        A 2       1      51-   52
VAR021     F 1. 0       1      54-   54
VAR022     F 1. 0       1      56-   56
VAR023     F 1. 0       1      58-   58
VAR024     F 2. 0       1      60-   61
VAR025     F 1. 0       1      63-   63
VAR026     F 2. 0       1      65-   66
                        F1.0,F3.0,1X,F4.0,1X,F1.0,2X,/,A1,3F2.0,A3,11F2.0,F2.1,
VAR027     F 1. 0       1      68-   68
VAR028     F 3. 0       1      69-   71
VAR029     F 4. 0       1      73-   76
VAR030     F 1. 0       1      78-   78
VAR031        A 1       2       1-    1
VAR032     F 2. 0       2       2-    3
VAR033     F 2. 0       2       4-    5
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ACCORDING TO YOUR INPUT FORMAT, VARIABLES ARE TO BE READ AS FOLLOWS

VARIABLE	FORMAT	RECORD	COLUMNS
VAR034	F 2. 0	2	6- 7
VAR035	A 3	2	8- 10
VAR036	F 2. 0	2	11- 12
VAR037	F 2. 0	2	13- 14
VAR038	F 2. 0	2	15- 16
VAR039	F 2. 0	2	17- 18
VAR040	F 2. 0	2	19- 20
VAR041	F 2. 0	2	21- 22
VAR042	F 2. 0	2	23- 24
VAR043	F 2. 0	2	25- 26
VAR044	F 2. 0	2	27- 28
VAR045	F 2. 0	2	29- 30
VAR046	F 2. 0	2	31- 32
VAR047	F 2. 1	2	33- 34

F1.0,4F4.0,F3.0,3F2.0,2F3.1,2A1,F2.0,F4.0,6X/F1.0,F4.0,A4,

VARIABLE	FORMAT	RECORD	COLUMNS
VAR048	F 1. 0	2	35- 35
VAR049	F 4. 0	2	36- 39
VAR050	F 4. 0	2	40- 43
VAR051	F 4. 0	2	44- 47
VAR052	F 4. 0	2	48- 51
VAR053	F 3. 0	2	52- 54
VAR054	F 2. 0	2	55- 56
VAR055	F 2. 0	2	57- 58
VAR056	F 2. 0	2	59- 60
VAR057	F 3. 1	2	61- 63
VAR058	F 3. 1	2	64- 66
VAR059	A 1	2	67- 67
VAR060	A 1	2	68- 68
VAR061	F 2. 0	2	69- 70
VAR062	F 4. 0	2	71- 74
VAR063	F 1. 0	3	1- 1
VAR064	F 4. 0	3	2- 5
VAR065	A 4	3	6- 9

F4.0,A4,2F4.0,2X,F2.0,4X,7A4,3A2,3A1,F1.0,2F2.0,3A1,A2)

VARIABLE	FORMAT	RECORD	COLUMNS
VAR066	F 4. 0	3	10- 13
VAR067	A 4	3	14- 17
VAR068	F 4. 0	3	18- 21
VAR069	F 4. 0	3	22- 25
VAR070	F 2. 0	3	28- 29
VAR071	A 4	3	34- 37
VAR072	A 4	3	38- 41
VAR073	A 4	3	42- 45

ACCORDING TO YOUR INPUT FORMAT, VARIABLES ARE TO BE READ AS FOLLOWS

VARIABLE	FORMAT	RECORD	COLUMNS
VAR074	A 4	3	46- 49
VAR075	A 4	3	50- 53
VAR076	A 4	3	54- 57
VAR077	A 4	3	58- 61
VAR078	A 2	3	62- 63
VAR079	A 2	3	64- 65
VAR080	A 2	3	66- 67
VAR081	A 1	3	68- 68
VAR082	A 1	3	69- 69
VAR083	A 1	3	70- 70
VAR084	F 1. 0	3	71- 71
VAR085	F 2. 0	3	72- 73
VAR086	F 2. 0	3	74- 75
VAR087	A 1	3	76- 76
VAR088	A 1	3	77- 77
VAR089	A 1	3	78- 78
VAR090	A 2	3	79- 80

THE INPUT FORMAT PROVIDES FOR 90 VARIABLES. 90 WILL BE READ
IT PROVIDES FOR 3 RECORDS ('CARDS') PER CASE. A MAXIMUM OF 80 'COLUMNS' ARE USED ON A RECORD.

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COMMENT        ONE - PROGRAM TO CALCULATE PERCENT EXPECTED BATTERY
                     LIFE USED AT THE TIME A BATTERY WAS REPLACED.

COMMENT        VAR069 IS RBDT IN JULIAN DATE FORMAT - THE FOLLOWING CARDS CREATE
               NEW VARIABLE VARBDT WHICH IS RBDT CONVERTED INTO DAYS
IF             (VAR069 GT 0 AND VAR069 LE 365) VARBDT = VAR069
IF             (VAR069 GE 1000 AND VAR069 LE 1365) VARBDT = (VAR069 -1000) +365
IF             (VAR069 GE 2000 AND VAR069 LE 2365) VARBDT = (VAR069 -2000) +730
IF             (VAR069 GE 3000 AND VAR069 LE 3365) VARBDT = (VAR069 -3000) +1095
COMMENT        THE FOLLING CARDS CREATE NEW VARIABLES VARUSE WHICH IS THE TIME
               BATTERY HAS BEEN IN SERVICE IN JULIAN FORMAT AND VARDAY THE SAME
               TIME CONVERTED INTO DAYS - VARDAT IS WORK DATE JULIAN EQUIVALENT
IF             ((VAR051 - VAR062) GE 366) VARDAT = (VAR051 -1000) +365
COMPUTE        VARUSE = VARDAT - VAR062
IF             (VARUSE GE 0 AND VARUSE LE 730) VARDAY = VARUSE
IF             (VARUSE GE 999 AND VARUSE LE 1730) VARDAY = (VARUSE -1000) +365
IF             (VARUSE GE 1999 AND VARUSE LE 2730) VARDAY = (VARUSE -2000) +730
IF             ((VAR051 - VAR062) GE 0 AND (VAR051 - VAR062) LT 366)
               VARDAY = VAR051 - VAR062
COMMENT        VARPER IS NEW VARIABLE PERCENT OF EXPECTED BATTERY LIFE CONSUMED
               AS OF THE WORK DATE BASED UPON RBDT - WHERE THE BATTERY WAS
               REPLACED ON THE WORK DATE THE PERCENT INDICATES SURVIVAL
               PERFORMANCE OF THE OLD BATTERY.  VAR072 VALUES WERE RECODED
               SO THAT BATTERIES REPLACED BECAUSE OF WITHDRAWALS FOR EXAMPLE,
               WOULD BE INCLUDED.
RECODE         VAR072 ('84W','84X','84S'87W','87X','87S','73W','73X','73S',
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                   '72PI'=7887)
IF                 (VAR071 NE ' ' OR VAR072 EQ 7887) VARPER = RND((VARDAY/VARBDT)
                   *100)

RECODE             VAR071 ('42X','42TB','42T','42E','42C'=426)
                          ('42M','42S'=421)('42O'=425)('42A'=423)
                          ('42W','42L','42G','42DY','42DX','81DZ','81DX'=422)
                          ('81FC','42FU','42FC'=427)
                          ('42GM','42GL','42K','42FS','42FP','42FI'=424)
RECODE             VAR073 ('46J','46E','46C','46TB','46N'=466)
                          ('46ZG','46W','46L','46G','46DZ','46DN'=462)
                          ('46M'=461)('46O'=465)('46R'=468)('46VB'=469)
                          ('46K','46FR','46FI'=464)('46FW','46FD','46FC'=467)
RECODE             VAR074 ('47M'=471)('47ZG','47W','47L','47G','47DZ','47DN'=472)
                          ('47K','47FR','47FI'=474)('47O'=475)('47R'=478)
                          ('47TB','47N','47J','47E','47C'=476)('47FC'=477)
                          ('47VB'=479)
RECODE             VAR075 ('50M'=501)('50W','50L','50G','50DZ'=502)
                          ('50K','50FR'=504)('50O'=505)('50FU','50FC'=507)
                          ('50Y','50TB','50N','50J','50E'=506)
                          ('50R'=508)
RECODE             VAR076 ('51Z','51W','51L','51G','51DZ','51DN'=512)
                          ('51K','51FR'=514)('51Y','51TB','51J','51E','51C'=516)
                          ('51FL'=517)('51R'=518)
                          ('51PG','51PF','51VB','51VA','51H'=519)
RECODE             VAR077 ('45FW','45FV','45FU','45FL','45FD','45FC'=777)
                          ('45FI','45FP','45FR','45FS'=774)
                          ('64M'=771)('64W'=772)
MISSING VALUES     VAR059,VAR060,VAR081 TO VAR083,VAR087 TO VAR089(' ')/
                   VAR079,VAR080('   ')/VAR035('   ')/
                   VAR065,VAR067,VAR071 TO VAR077('    ')/
                   VAR033,VAR034,VAR037 TO VAR047,VAR055,VAR056,VAR061,VAR064,
                   VAR066,VAR068,VAR069,VAR084 TO VAR086,VARPER(0)
VAR LABELS         VAR001,LIGHT LIST NUMBER/
                   VAR002,OPERATION/
                   VAR003,LOCATION/
                   VAR004,BUOY SIZE/
                   VAR005,CONSTRUCTION/
                   VAR006,VENT VALVES PER POCKET/
                   VAR007,LIGHT CHARACTERISTIC/
                   VAR008,LIGHT COLOR/
                   VAR009,LAMP TYPE/
                   VAR010,LANTERN-OPTIC/
                   VAR011,AVAILABLE SPARE CODE/
                   VAR012,POWER SOURCE-BATTERY/
                   VAR013,BATTERY REUSE CODE/
                   VAR014,LAMPCHANGER/
                   VAR015,FLASHER/
                   VAR016,SOUND SIGNAL/
                   VAR017,DAYLIGHT CONTROL/
                   VAR018,BOTTOM DESCRIPTION/
                   VAR019,BOTTOM CHARACTERISTIC/
                   VAR020,DEPTH OF WATER IN FEET/
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VAR021,BRIDLE SIZE/
VAR022,SWIVEL SIZE AND NUMBER/
VAR023,FIRST CHAIN SIZE/
VAR024,FIRST CHAIN LENGTH IN FATHOMS/
VAR025,SECOND CHAIN SIZE/
VAR026,SECOND CHAIN LENGTH/
VAR027,NUMBER OF SINKERS/
VAR028,TOTAL SINKER WEIGHT-RIPRAP DIST./
VAR029,AID CONTROL NUMBER/
VAR030,TOTAL NUMBER OF VISITS 1972-1973/
VAR031,WORK REASON/
VAR032,INITIAL CONDITION OF AID/
VAR033,INITIAL CONDITION OF AID/
VAR034,INITIAL CONDITION OF AID/
VAR035,DISTANCE 10'S YARDS OFF STATION/
VAR036,WORK PERFORMED/
VAR037,WORK PERFORMED/
VAR038,WORK PERFORMED/
VAR039,WORK PERFORMED/
VAR040,WORK PERFORMED/
VAR041,WORK PERFORMED/
VAR042,WORK PERFORMED/
VAR043,WORK PERFORMED/
VAR044,WORK PERFORMED/
VAR045,WORK PERFORMED/
VAR046,WORK PERFORMED/
VAR047,TIME SPENT ON SITE-TENTHS HOURS/
VAR048,TOTAL NO. OF DISCREPANCIES OF AID/
VAR049,JULIAN DATE CG INFORMED DISCREP/
VAR050,HOUR CG INFORMED OF DISCREPANCY/
VAR051,J.DATE WORK PERFORMED-OR 3365END/
VAR052,HOUR WORK PERFORMED/
VAR053,DAYS INITIAL NOTN TIL NEXT VISIT/
VAR054,FINAL CONDITION OF AID/
VAR055,FINAL CONDITION OF AID/
VAR056,FINAL CONDITION OF AID/
VAR057,CLOSED CIRCUIT VOLT NEW BATTERY/
VAR058,CLOSED VOLT OLD-EXISTING BATTERY/
VAR059,UNIT WORK PERFORMED BY/
VAR060,PRIMARY METHOD OF POSITIONING/
VAR061,PRIMARY CAUSE OF FAILURE-SANDS/
VAR062,JULIAN DATE LAST RECHARGED/
VAR063,EXTRA CODE/
VAR064,SCHEDULED SERVICE DATE/
VAR065,DAYS SERVICE IN VARIANCE SCHED/
VAR066,SCHEDULED RELIEF-WITHDRAWL DATE/
VAR067,DAYS RELIEF IN VARIANCE SCHED/
VAR068,SCHEDULED RECHARGE DATE/
VAR069,RATED BATTERY DISCHARGE TIME/
VAR070,NO.BURNED OUT LAMPS REPLACED/
VAR071,POWER UNIT,S REPLACED WITH REASON/
VAR072,BUOY RELIEVED WITH REASON/
VAR073,FLASHER REPLACED WITH REASON/
VAR074,LAMPCHANGER REPLACED WITH REASON/
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              VAR075,DAYLIGHT CONTROL REP.WTIH REASON/
              VAR076,LANTERN-OPTIC REP.WITH REASON/
              VAR077,MOORINGS SP-CODE REP WITH REASON/
              VAR078,MAIN CAUSE FOR FAILURE OR RELATED NOTE/
              VAR079,MAIN CAUSE FOR FAILURE OR RELATED NOTE/
              VAR080,COMPONENT LOST-DAMAGED DURING SERVICING/
              VAR081,REASON DELAY IF DISCREP REPORTED/
              VAR082,NATURE OF SERVICE/
              VAR083,REASON WHY IF TEMPORARY/
              VAR084,NO.VISITS RELATED EACH DISCREP/
              VAR085,COMPONENT REQUIRED IF TEMPORARY/
              VAR086,DAYS TIME TO EFFECT PERM SERVICE/
              VAR087,COMMENT AND ERROR CODES/
              VAR088,COMMENT AND ERROR CODES/
              VAR089,COMMENT AND ERROR CODES/
              VAR090,ANALYSIS CARD CODE/
              VARPER,PERCENT EXPECTED BATTERY LIFE USED/
VALUE LABELS  VAR001 (1279)CCDS BY CH 18 18/
              VAR002 ('P')PERMANENT AID('T')TEMPORARY AID('S')SEASONAL-NO REPCT
              ('W')WINTER REPLACEMENT('D')AID DISCONTINUED/
              VAR003 ('B')EXPOSED SEA COAST('C')EXPOSED BAY,HARBOR('D')EXPOSED
              RIVER('E')EXPOSED BREAKWATER('F')EXPOSED ASHORE('K')SEMI-EXPO SEA
              COAST('L')SEMI-EXPO BAY,HARBOR('M')SEMI-EXPO RIVER ('N')SEMI-EXPO
              BREAKWATER('O')SEMI-EXPO ASHORE('S')PROTECTED SEA COAST ('T')BAY,
              HARBOR PROTECTED('U')PROTECTED RIVER('V')PROTECTEDBREAKWATER('W')
              PROTECTED ASHORE(' ')AID DISCONTINUED/
              VAR004(510)5 X 10(511)5 X 11(620)6 X 20 (715)7.X 15(717)7 X 17
              (820)8 X 20(823)8 X 23 (826)8 X 26(932)9 X 32(934)9 X 34
              (938)9 X 38(039)10 X 39/
              VAR005 (11)RR,WLD,STOPCK,LRGVTS(51)RR,STOPCKS,LRGVTS/
              VAR006 (1)1,BALL INSTALLED(2)2,BALLS INSTLD(3)1 VENT ,NO BALLS(4)
              2 VENTS,NO BALLS/
              VAR007 (103)QK FL    0.3(122)QK FL * ALLOTHER(145)MO A.4FL.6EC,2.0
              -5(146)MO A*ALL OTHERS(255)FL 2.5  .5**(251)FL 2.5  .05*(404)FL 4
               .4(630)E INT   6 3.0/
              VAR008 ('W')WHITE ('R')RED ('G')GREEN/
              VAR009 (51)0.25 AMP 12VOLT(52)0.55 AMP 12VOLT(53)0.77 AMP 12VOLT
              (54)1.15 AMP 12VOLT(55)1.35 AMP 12VOLT(56)2.03 AMP 12VOLT (57)
              3.03 AMP 12VOLT/
              VAR010 (16)155 MM ACRYLIC (20)200 MM P.GLASS(23)200 MM  ALLOTHER/
              VAR011 ('U')UNLIGHTED SET 3365/
              VAR012 ('10E2')1000 A-H,EDISON#2('10JS')1000 A-H,EDISONJS('20E2')
              2000 A-H,2EDISON#2('20JS')1000 A-H,2EDISON JR ('20S1')2000 A-H,2
              EDSN STA  ('20S2')2000 A-H,2EDSN ST   ('10S1')1000 A-H,EDISON STA
              ('10S2')1000 A-H,EDISON ST('25BY')2500 A-H,EDISON-OLD('50BY')5000
              A-H,EDISON-OLD('30E2')3000 A-H,EDISON#2('30S1')3000 A-H,EDISONSTA
              ('60E2')6000 A-H,2EDSN#2('60S1')6000 A-H,2 EDSN STA('20U1')2000 A
              -H,2UN CARBIDE/
              VAR013 (' ')CONTINUOUS ('S')SECOND YEAR UNIT('T')THIRD YEAR UNIT/
              VAR014 (97)4 LAMP,FD-1297(65)6 LAMP,CG6P CRDC(66)6LAMP,CG6PVAPAR/
              VAR015 (65)C-R S-1065 SS(81)CG-181 C-R DEV.(83)VAPAIR/
              VAR016(40)ELECTRIC HORN850-02(79)WHISTLE 4 BALL(81)BELL PRE 1952
              TPR(82)BELL1952 TAPPER(83)BELL1962 TAPPER(85)GONG1952 TAPPER(86)G
              ONG1962 TAPPER(0)NO SOUND SIGNAL(78)WHISTLE 2 BALL/
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VAR017 (31)C-CLEAR-ALL(32)R-COLOR PLASTIC   (33)B-COLOR GLASS
(11)CR-S1065-LS1(13)CR-S1065-LS MNTD FLR/
VAR018 ('G')GRAVEL('H')BOULDERS('I')CLAY('J')SHELLS('K')CORAL
('L')LAVA('M')MUD('N')CHALK('O')STONES('P')PEBBLES('Q')SHINGLE
('R')ROCK('S')SAND/
VAR019 (1)FINE(2)COARSE(3)SOFT(4)HARD(5)STIFF(6)STICKY/
VAR021 (1)7-8" X 10'(2)1" X12'(3)1" X 15'(4)1 1-4" X 15' (5)
1 1-4" X 25'(6)1 1-2" X 18'(7) 1 1-2" X 26' (9)OTHER/
VAR022 (2)1 1-2" 3RD CLASS(3)1 3-4" 2ND CLASS(4)2" 1ST CLASS
(5)TWO 1 1-4"(6)TWO 1 1-2"(7)TWO 1 3-4"(8)TWO 2" (9)OTHER/
VAR023 (4)1"(5)1 1-8"(6)1 1-4"(7)1 1-2"(8)1 5-8"AND LARGER/
VAR030 (1)1 VISIT(2)2 VISITS(3)3 VISITS(4)4 VISITS(5)5 VISITS
(6)6 VISITS(7)7 VISITS(8)8 VISITS(9)9 VISITS/
VAR031 (1)ROUTINE (2)SEASONAL CHANGE(3)TEMPORARY CHANGE(4)END
TEMP CHANGE(5)DISCREP REPORTED (6)DISCREP DISCOVERED(7)PROJECT(8)
SEE COMMENTS(9)SEE COMMENTS('A')SEE COMMENTS('B')SEE COMMENTS
('C')SEE COMMENTS  ('D')SEE COMMENTS('F')SEE COMMENTS  ('M')SEE
COMMENTS ('O')SEE COMMENTS('L')SEE COMMENTS('N')SEE COMMENTS('T')
SEE COMMENTS('W')SEE COMMENTS ('U')SEE COMMENTS('S')SEE COMMENTS/
VAR032 (00)NORMAL (01)LIGHT EXTENGSHD,DIM (02)IMPROPER LT CHAR
(03)SOUND SIG DISCREP (04)RADIOBEAC DISCREP (05)OFF STATION   (6)
AGROUND (07)SINKING (10)DAMAGED (11)DESTROYED (12)MISSING
(54)SOUND DEV NOTINEFFCT(55)BUOYBADLYDETERIATED(68)POCKTCOVBNDMSG
(88)POCKET FLOODED (90)LANTER FLOODED (91)BAD WIRING (93)LT FLS
DAYLIGHT (94)WITHDRAWN(95)SUNK(96)ADRIFT (97)POCKETCOVERMISSING
(98)LAMPCHGR WONT ROTATE(99)OTHER/
VAR033 (00)NORMAL (01)LIGHT EXTENGSHD,DIM (02)IMPROPER LT CHAR
(03)SOUND SIG DISCREP (04)RADIOBEAC DISCREP (05)OFF STATION   (6)
AGROUND (07)SINKING (10)DAMAGED (11)DESTROYED (12)MISSING
(54)SOUND DEV NOTINEFFCT(55)BUOYBADLYDETERIATED(68)POCKTCOVBNDMSG
(88)POCKET FLOODED (90)LANTER FLOODED (91)BAD WIRING (93)LT FLS
DAYLIGHT (94)WITHDRAWN(95)SUNK(96)ADRIFT (97)POCKETCOVERMISSING
(98)LAMPCHGR WONT ROTATE(99)OTHER/
VAR034 (00)NORMAL (01)LIGHT EXTENGSHD,DIM (02)IMPROPER LT CHAR
(03)SOUND SIG DISCREP (04)RADIOBEAC DISCREP (05)OFF STATION   (6)
AGROUND (07)SINKING (10)DAMAGED (11)DESTROYED (12)MISSING
(54)SOUND DEV NOTINEFFCT(55)BUOYBADLYDETERIATED(68)POCKTCOVBNDMSG
(88)POCKET FLOODED (90)LANTER FLOODED (91)BAD WIRING (93)LT FLS
DAYLIGHT (94)WITHDRAWN(95)SUNK(96)ADRIFT (97)POCKETCOVERMISSING
(98)LAMPCHGR WONT ROTATE(99)OTHER/
VAR054 (00)NORMAL (01)LIGHT EXTENGSHD,DIM (02)IMPROPER LT CHAR
(03)SOUND SIG DISCREP (04)RADIOBEAC DISCREP (05)OFF STATION   (6)
AGROUND (07)SINKING (10)DAMAGED (11)DESTROYED (12)MISSING
(54)SOUND DEV NOTINEFFCT(55)BUOYBADLYDETERIATED(68)POCKTCOVBNDMSG
(88)POCKET FLOODED (90)LANTER FLOODED (91)BAD WIRING (93)LT FLS
DAYLIGHT (94)WITHDRAWN(95)SUNK(96)ADRIFT (97)POCKETCOVERMISSING
(98)LAMPCHGR WONT ROTATE(99)OTHER/
VAR055 (00)NORMAL (01)LIGHT EXTENGSHD,DIM (02)IMPROPER LT CHAR
(03)SOUND SIG DISCREP (04)RADIOBEAC DISCREP (05)OFF STATION   (6)
AGROUND (07)SINKING (10)DAMAGED (11)DESTROYED (12)MISSING
(54)SOUND DEV NOTINEFFCT(55)BUOYBADLYDETERIATED(68)POCKTCOVBNDMSG
(88)POCKET FLOODED (90)LANTER FLOODED (91)BAD WIRING (93)LT FLS
DAYLIGHT (94)WITHDRAWN(95)SUNK(96)ADRIFT (97)POCKETCOVERMISSING
(98)LAMPCHGR WONT ROTATE(99)OTHER/
```

```
VAR056 (00)NORMAL (01)LIGHT EXTENGSHD,DIM (02)IMPROPER LT CHAR
(03)SOUND SIG DISCREP (04)RADIOBEAC DISCREP (05)OFF STATION (6)
AGROUND (07)SINKING (10)DAMAGED (11)DESTROYED (12)MISSING
(54)SOUND DEV NOTINEFFCT(55)BUOYBADLYDETERIATED(69)POCKTCOVBNDMSG
(88)POCKET FLOODED (90)LANTER FLOODED (91)BAD WIRING (93)LT FLS
DAYLIGHT (94)WITHDRAWN(95)SUNK(96)ADRIFT (97)POCKETCOVERMISSING
(98)LAMPCHGR WONT ROTATE(99)OTHER/
VAR059 ('P')PRIMARY('S')SECONDARY('N')OTHER/
VAR060 ('S')SEXTANT ANGLES('V')VISUAL BEARINGS,RNG ('R')RADAR
RANGES('K')NOT CHECKED ('W')WITHDRAWN/
VAR061 (00)NORMAL(01)OMITTED-DISCR(02)COLCTD 452.04DMGS (03)
FALSE ALARM (22)BATTERY FAILURE (23)TARDY SERVICE (24)PERS ERROR
(26)FLOODED (27)CAUGHT DOWN (28)WEATHER (29)ICE(30)COLLISION (31)
VANDALISM (33)UNKNOWN(45)LAMPS(51)LANTERN(52)SOUND SIGNAL(53)
TAPPERS(58)WIRING (59)SHACKLE(60)BRIDLE(61)FIRST CHAIN (62)SECOND
CHAIN(63)SINKER/
VAR071 (421)ROUTINE SERVICING (422)ENVRNMTL HAZARDS (423)TECH-
ADMIN ERRORS(424)PERSONNEL ERRORS(425)CAUSED BY OTHR CMPNT (426)
CONVENIENCE-FOLLOWP(427)MANUFCTRG ERRORS (428)CORROSION (429)
PROJECTS-EXPERIMNTL/
VAR073 (461)ROUTINE SERVICING (462)ENVRNMTL HAZARDS (463)TECH-
ADMIN ERRORS(464)PERSONNEL ERRORS(465)CAUSED BY OTHR CMPNT(466)
CONVENIENCE-FOLLOWP(467)MANUFCTRG ERRORS (468)CORROSION (469)
PROJECTS-EXPERIMNTL/
VAR074 (471)ROUTINE SERVICING (472)ENVRNMTL HAZARDS (473)TECH-
ADMIN ERRORS(474)PERSONNEL ERRORS(475)CAUSED BY OTHR CMPNT(476)
CONVENIENCE-FOLLOWP(477)MANUFCTRG ERRORS (478)CORROSION (479)
PROJECTS-EXPERIMNTL/
VAR075 (501)ROUTINE SERVICING (502)ENVRNMTL HAZARDS (503)TECH-
ADMIN ERRORS(504)PERSONNEL ERRORS(505)CAUSED BY OTHR CMPNT (506)
CONVENIENCE-FOLLOWP(507)MANUFCTRG ERRORS (508)CORROSION (509)
PROJECTS-EXPERIMNTL(791)ROUTINE SERVICING(792)ENVIRONMNTL HAZARDS
(793)TECH-ADMIN ERRORS (794)PERSONNEL ERRORS (795)CAUSED BY OTHR
CMPNT(796)CONVENIENCE-FOLLOWP(797)MANUFACTURING ERRORS(580)
CORROSION (799)PROJECTS-EXPERIMNTL(801)ROUTINE SERVICING (802)
ENVIRONMNTL HAZARDS(803)TECH-ADMIN ERRORS(804)CONVENIENCE-FOLLOWP
(805)CAUSED BY OTHR CMPNT(806)CONVENIENCE FOLLOWP(807)MANUFACUR
ERRORS(808)CORROSION (809)PROJECTS-EXPERIMNTL/
VAR076 (511)ROUTINE SERVICING (512)ENVRNMTL HAZARDS (513)TECH-
ADMIN ERRORS (514)PERSONNEL ERRORS(515)CAUSED BY OTHR CMPNT(516)
CONVENIENCE-FOLLOWP(517)MANUFCTRG ERRORS (518)CORROSION (519)
PROJECTS-EXPERIMNTL(751)ROUTINE SERVICING(752)ENVIRONMNTL HAZARDS
(753)TECH-ADMIN ERRORS(754)PERSONNEL ERRORS (755)CAUSED BY OTHR
CMPNT(756)CONVENIENCE-FOLLOWP(757)MANUFACTURING ERRORS(758)
CORROSION(759)PROJECTS-EXPERIMNTL(5200)OPORD 152-72(5100)OPORD 06
7-71/
VAR077 (771)PRVNT MAINTENANCE(772)WX-WIND-STORM(774)LAMP-PERS ERR
ORS(777)LAMP-MNFG ERRORS/
VAR078(00)NONE (01) OMITTED-DISCY(03)FALSE ALARM(22)POWER-BATTE
RY(23)TARDY SERVICE(24)PERSONNEL ERROR(25)WORN-BKN MOORINGS(26)FL
OODED(27)CAUGHT DOWN(28)WEATHER(29)ICE(30)COLLISION(31)VANDALISM
(33)UNKNOWN(45)ALL LAMPS(46)FLASHER(47)LAMPCHANGER(50)DAYLIGHT CO
NTROL(51)LANTERN(52)SOUND SIGNAL(53)TAPPERS(58)WIRING(59)SHACKLE
(60)BRIDLE(61)FIRST CAHIN(62)SECOND CHAIN(63)SINKER(67)MOORINGS
```

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                (69)BUOY DETIORATION(70)MOORINGS RPLD PVCS(72)POCK COV MSG (73)PE
                RSNL BELVD PM REQ(81)CCBN WX,VDZ,UKN,PE(84)2ND CONSCV DISCY(85)3R
                D + CONSCV DISCY(88)SWIVEL(92)VEE BAND/
                VAR079(00)NONE   (01) OMITTED-DISCY(03)FALSE ALARM(22)POWER-BATTE
                RY(23)TARDY SERVICE(24)PERSONNEL ERROR(25)WORN-BKN MOORINGS(26)FL
                OODED(27)CAUGHT DOWN(28)WEATHER(29)ICE(30)COLLISION(31)VANDALISM
                (33)UNKNOWN(45)ALL LAMPS(46)FLASHER(47)LAMPCHANGER(50)DAYLIGHT CO
                NTROL(51)LANTERN(52)SOUND SIGNAL(53)TAPPERS(58)WIRING(59)SHACKLE
                (60)BRIDLE(61)FIRST CAHIN(62)SECOND CHAIN(63)SINKER(67)MOORINGS
                (69)BUOY DETIORATION(70)MOORINGS RPLD PVCS(72)POCK COV MSG (73)PE
                RSNL BELVD PM REQ(81)CCBN WX,VDZ,UKN,PE(84)2ND CONSCV DISCY(85)3R
                D + CONSCV DISCY(88)SWIVEL(92)VEE BAND/
PRINT FORMAT    VAR002,VAR003,VAR008,VAR011 TO VAR015,VAR018 TO VAR020,VAR031,
                VAR035,VAR059,VAR060,VAR065,VAR067,VAR078 TO VAR083,
                VAR087 TO VAR090 (A)/VAR001 (2)/VAR004 TO VAR007,VAR009,VAR010,
                VAR014 TO VAR017,VAR021 TO VAR030,VAR032 TO VAR034,
                VAR036 TO VAR046,VAR048 TO VAR056,VAR061 TO VAR064,VAR066,
                VAR069 TO VAR077,VAR084 TO VAR086 (0)/VAR047,VAR057,VAR058 (1)
*SELECT IF      (VAR071 GE 421 AND VAR071 LE 429)
CODEBOOK        VAR071
OPTIONS         4


COMMENT         REASONS FOR REPLACEMENTS CAN BE REGROUPED INTO THE FOLLOWING
                CATEGORIES:

                    1. CODES S,M          : ROUTINE SERVICING,PREVENT MAINTENANCE.
                    2. CODES DN,DX,DY,DZ  : HAZARDS OF WATER DAMAGE,MISSING AIDS,
                             G,I,L,W,ZF     ICE,COLLISION,WEATHER,AND VANDALISM.
                             ZG,ZT
                    3. CODE  A            : TECHNICAL OR ADMINISTRATIVE ERRORS.
                    4. CODES FA,FI,FP,FR  : PERSONNEL ERRORS IN INSTALLATION,
                             FS,K,QM,QE     SCHEDULING,REPAIRS,OR TARDY SERVICING.
                    5. CODES B,O          : FAILURES CAUSED BY ANOTHER COMPONENT
                                            SUCH AS SOUND DEVICE,LANTERN DEFECTS.
                    6. CODES C,E,J,N,T    : CONVENIENT OR CONJUNCTIVE SERVICING
                             TB,TH,TO,U     FOLLOWUP VISITS
                             X,Y
                    7. CODES FC,FD,FL,FU  : MANUFACTURING ERRORS, DEFECTS IN
                             FV,FW          WORKMANSHIP OR PREMATURE WEAROUT.
                    8. CODE  R            : CORROSION, DEPENDS UPON TYPE OF
                                            COMPONENT FOR REGOUPING IN 1 - 7.
                    9. CODE P-,V-,H       : PROJECTS,DIRECTIVES,EXPERIMENTS


READ INPUT DATA
```

```
***** GIVEN SPACE ALLOWS FOR   1 VARIABLES AND  1498 VALUES FOR CODEBOOK *****

          *SELECT IF     (VAR071 EQ 422 OR VAR071 EQ 424 OR VAR071 EQ 427)
          CROSSTABS      VAR071 BY VAR007,VAR003,VAR004,VAR006,VAR012,VAR014 TO VAR018,
                         VAR021 TO VAR023,VAR069

          COMMENT        * NON-STANDARD FLASHER        ** FL 2.5 (0.5) AND FL 6.0 (1.0)
                         FLASHERS WERE TO BE PERMANENTLY REPLACED BY FL 2.5 (0.3) AND
                         FL 6.0 (0.6) FLASHERS RESPECTIVELY COMMENCING IN 1973

          COMMENT        ON OUTPUT PAGE 26, RATED BATTERY DISCHARGE TIME IS IN JULIAN
                         FORMAT.  FOR EXAMPLE, 2152 REPRESENTS 2 YEARS AND 152 DAYS OR
                         882 DAYS.
```



```
***** GIVEN SPACE ALLOWS FOR  3749 CELLS AND   2 DIMENSIONS FOR CROSSTABS *****

          MARGINALS      VARPER
          STATISTICS     ALL

          COMMENT        SEE PROGRAM PAGE 3 FOR EXPLANATION OF THE PROCEDURES INVOLVED
                         IN DETERMINING PERCENT EXPECTED POWER UNIT LIFE USED AT THE
                         TIME OF REPLACEMENT.
```

```
CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING                    01/15/75        PAGE   32

***** GIVEN SPACE ALLOWS FOR   1 VARIABLES AND  2999 VALUES FOR MARGINALS *****

                *RECODE        VARPER (1 THRU 20=10)(21 THRU 40=30)(41 THRU 60=50)
                                      (61 THRU 70=65)(71 THRU 80=75)(81 THRU 90=85)
                                      (91 THRU 100=95)(101 THRU 110=105)(111 THRU 121=115)
                               (122 THRU HIGHEST=155)
                CROSSTABS      VAR003,VAR004,VAR006,VAR007,VAR012,VAR014 TO VAR018,VAR021 TO
                               VAR023,VAR069,VAR071 BY VARPER

CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING                    01/15/75        PAGE   51

***** GIVEN SPACE ALLOWS FOR  3749 CELLS AND   2 DIMENSIONS FOR CROSSTABS *****

                *SELECT IF     (VAR073 GE 461 AND VAR073 LE 469)
                CODEBOOK       VAR073
                OPTIONS        4

CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING                    01/15/75        PAGE   54

***** GIVEN SPACE ALLOWS FOR   1 VARIABLES AND  1498 VALUES FOR CODEBOOK *****

                *SELECT IF     (VAR073 EQ 462 OR VAR073 EQ 464 OR VAR073 EQ 467)
                CROSSTABS      VAR073 BY VAR004,VAR010,VAR014 TO VAR016

CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING                    01/15/75        PAGE   61

***** GIVEN SPACE ALLOWS FOR  3749 CELLS AND   2 DIMENSIONS FOR CROSSTABS *****

                *SELECT IF     (VAR074 GE 471 AND VAR074 LE 479)
                CODEBOOK       VAR074
                OPTIONS        4
```

```
CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING          01/15/75     PAGE  64

***** GIVEN SPACE ALLOWS FOR   1 VARIABLES AND  1498 VALUES FOR CODEBOOK *****

                 *SELECT IF     (VAR074 EQ 472 OR VAR074 EQ 474 OR VAR074 EQ 477)
                 CROSSTABS      VAR074 BY VAR009,VAR016

CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING          01/15/75     PAGE  67

***** GIVEN SPACE ALLOWS FOR  3749 CELLS AND   2 DIMENSIONS FOR CROSSTABS *****

                 *SELECT IF     (VAR075 GE 501 AND VAR075 LE 509)
                 CODEBOCK       VAR075
                 OPTIONS        4

CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING          01/15/75     PAGE  70

***** GIVEN SPACE ALLOWS FUR   1 VARIABLES AND  1498 VALUES FOR CODEBOOK *****

                 *SELECT IF     (VAR075 EQ 502 OR VAR075 EQ 504 OR VAR075 EQ 507)
                 CROSSTABS      VAR075 BY VAR008,VAR010,VAR016
                 STATISTICS     ALL

CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING          01/15/75     PAGE  74

***** GIVEN SPACE ALLOWS FOR  3749 CELLS AND   2 DIMENSIONS FOR CROSSTABS *****

                 *SELECT IF     (VAR076 GE 511 AND VAR076 LE 519)
                 CODEBOCK       VAR076
                 OPTIONS        4
```

```
CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING                01/15/75        PAGE   77

 ***** GIVEN SPACE ALLOWS FOR   1 VARIABLES AND  1498 VALUES FOR CODEBOOK *****

                    *SELECT IF      (VAR076 EQ 512 OR VAR076 EQ 514 OR VAR076 EQ 517)
                    CROSSTABS       VAR076 BY VAR003,VAR010,VAR016
                    STATISTICS      1


CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING                01/15/75        PAGE   81

 ***** GIVEN SPACE ALLOWS FOR  3749 CELLS AND   2 DIMENSIONS FOR CROSSTABS *****

                    *SELECT IF      (VAR077 EQ 774 OR VAR077 EQ 777)
                    CROSSTABS       VAR077 BY VAR003,VAR004,VAR009,VAR010,VAR016
                    STATISTICS      1


CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING                01/15/75        PAGE   87

 ***** GIVEN SPACE ALLOWS FOR  3749 CELLS AND   2 DIMENSIONS FOR CROSSTABS *****

                    *SELECT IF      (VAR077 EQ 771 OR VAR077 EQ 772)
                    CROSSTABS       VAR077 BY VAR003/VAR077 BY VAR018


CODEBOOK,MARGINALS,CROSSTABULATIONS AFTER BREAKDOWN RECODING                01/15/75        PAGE   90

 ***** GIVEN SPACE ALLOWS FOR  3749 CELLS AND   2 DIMENSIONS FOR CROSSTABS *****

                    FINISH
```

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